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Gas Journal

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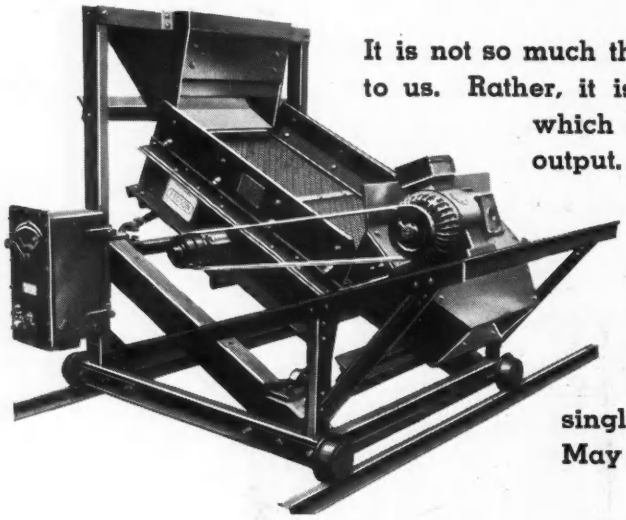

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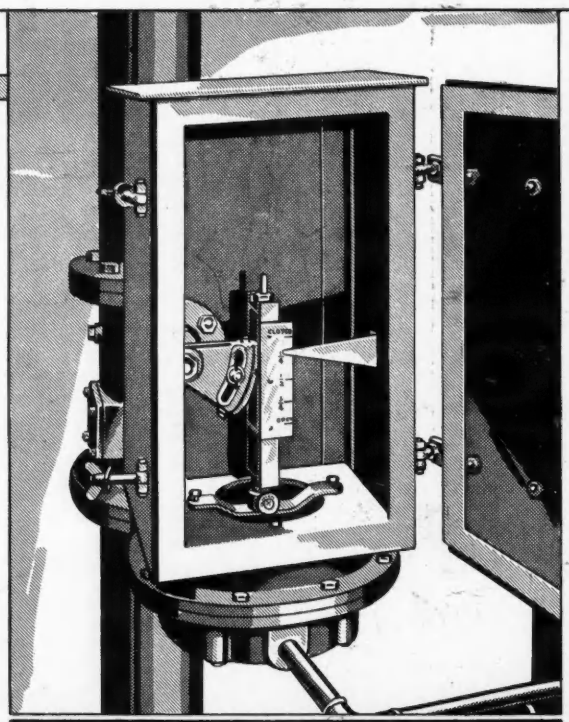

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GAS JOURNAL, AUG. 23, 1944

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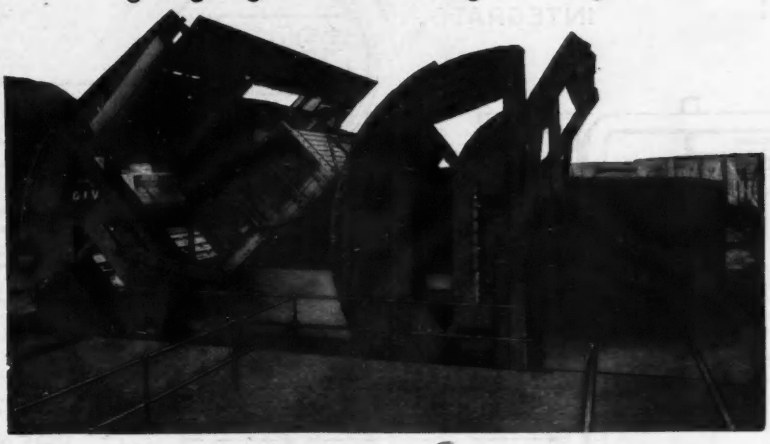

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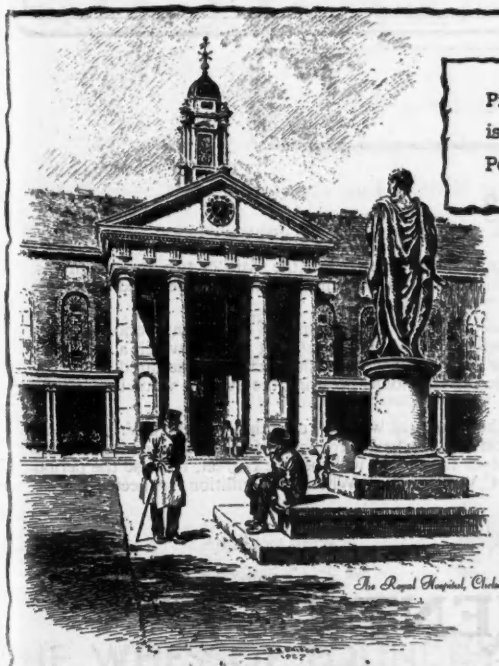

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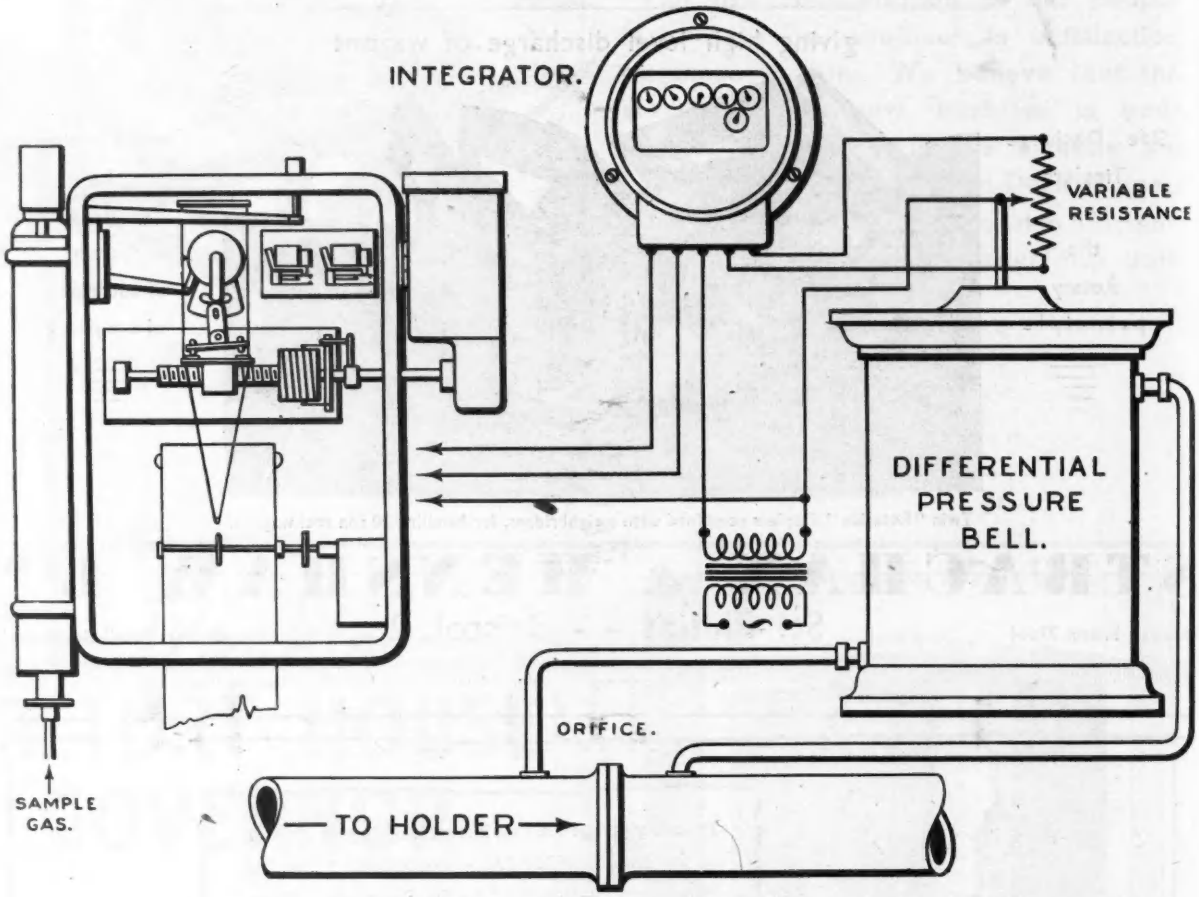

DIAGRAM No. 9

In most of the advertisements on Sigma Automatic C.V. Control, the controller is arranged to adjust the ratio of two streams of gas, one being of high, the other of low C.V. It will be clear that if the calorific value of the rich stream falls below the declared value, the controller will shut off all the diluent, but it cannot make this gas richer than the richest stream.

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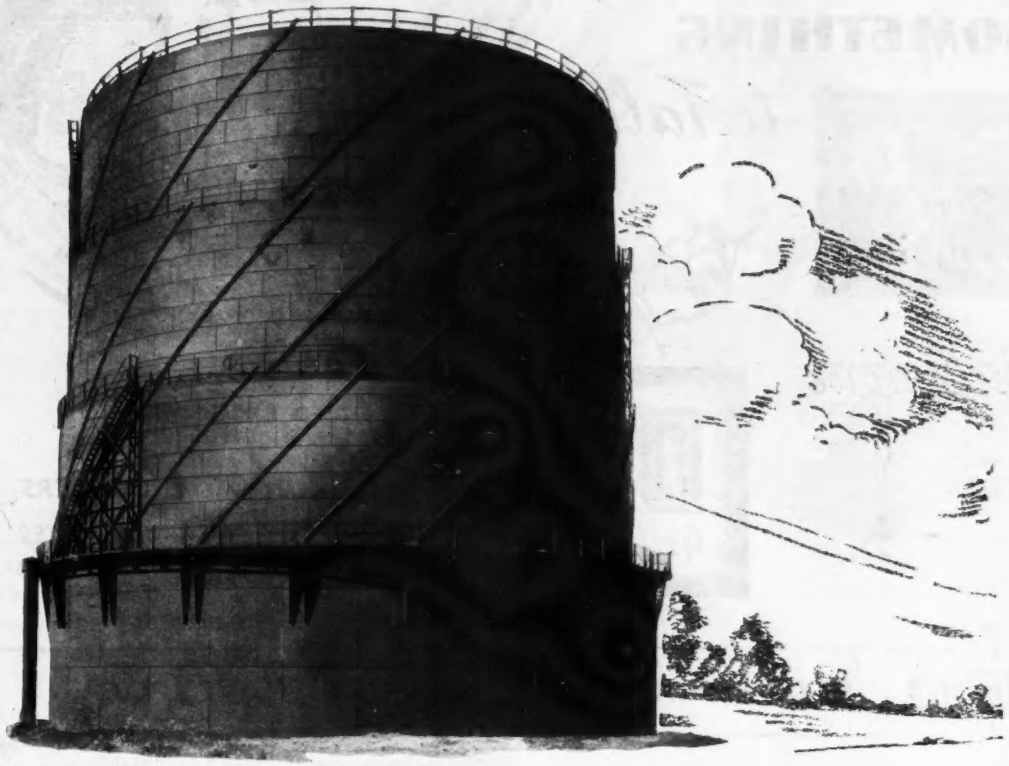

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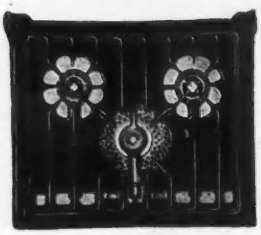

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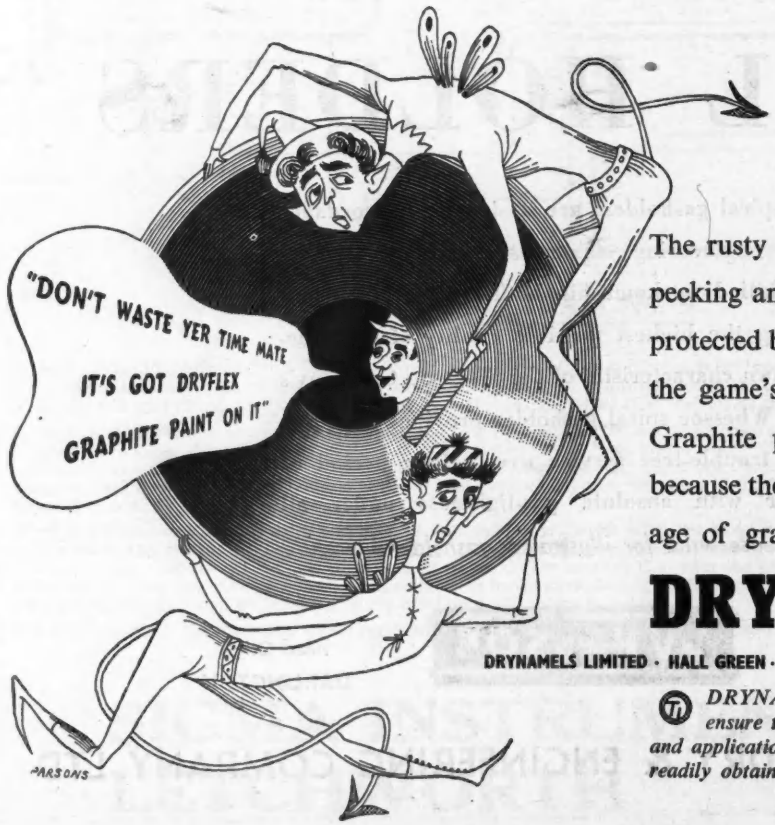

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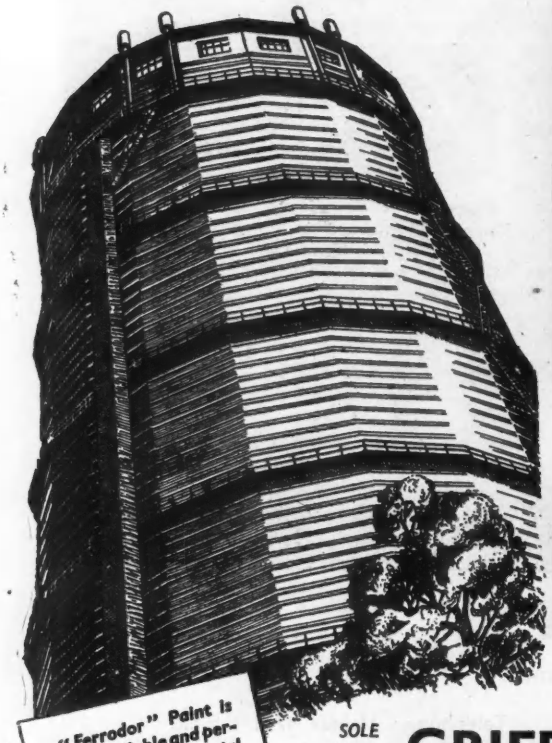

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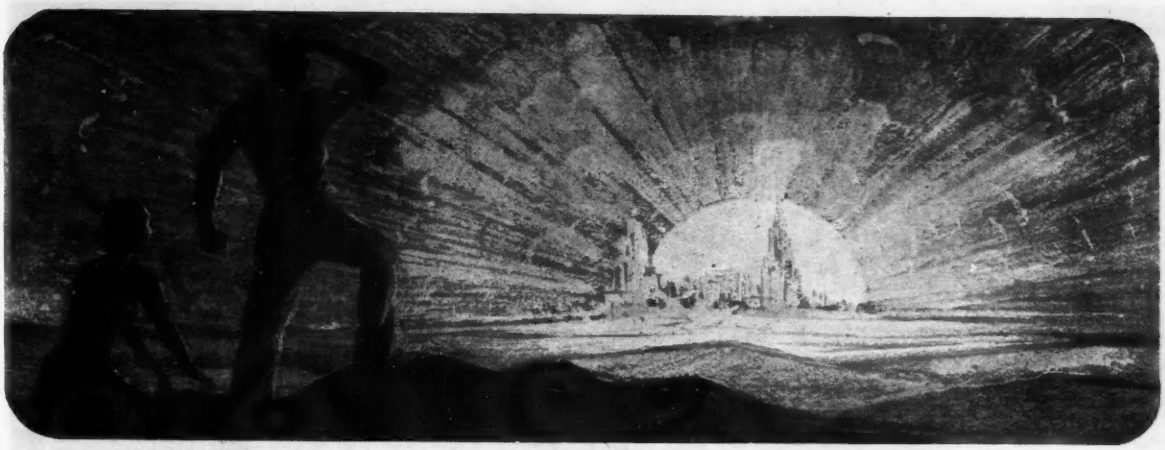

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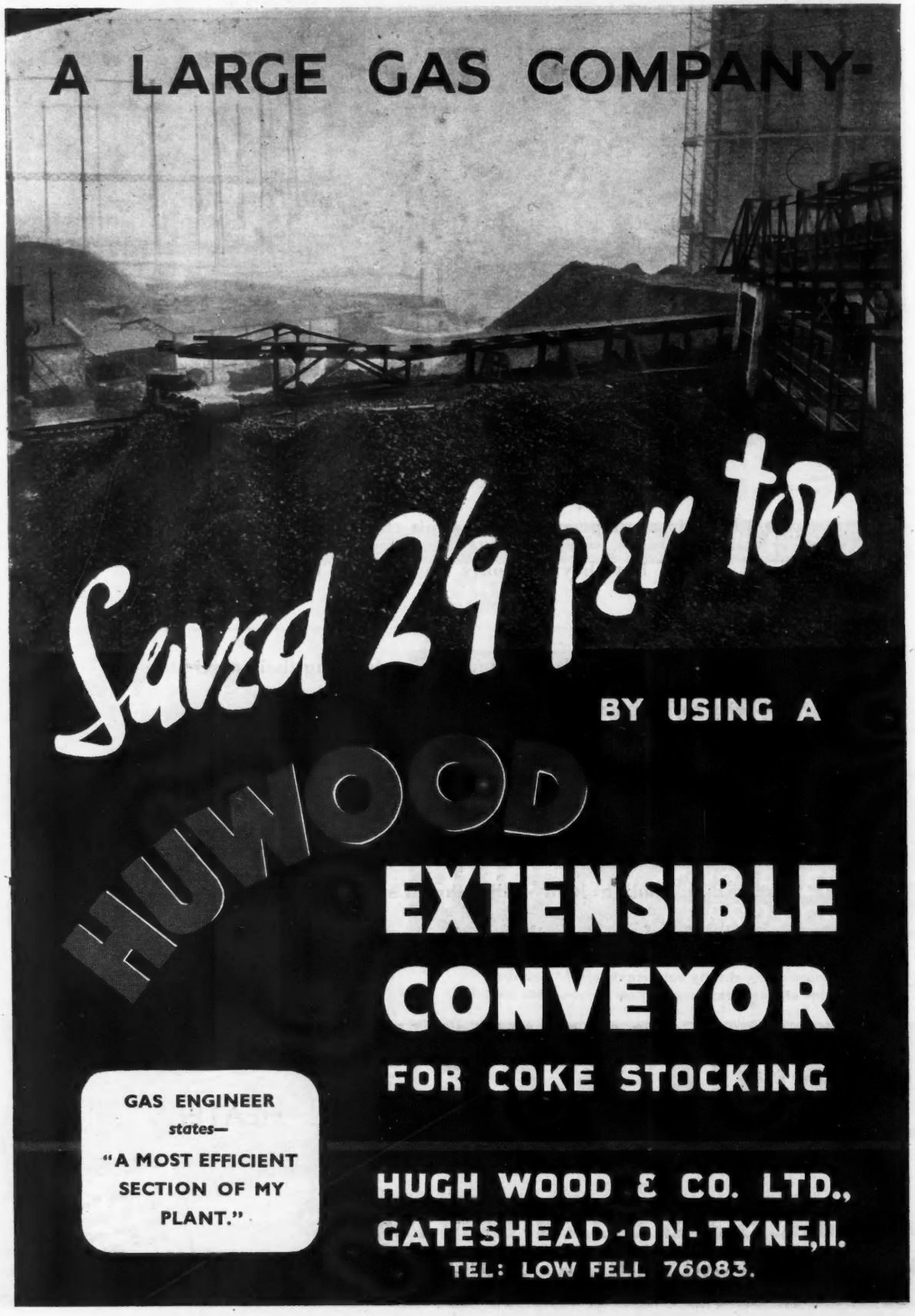
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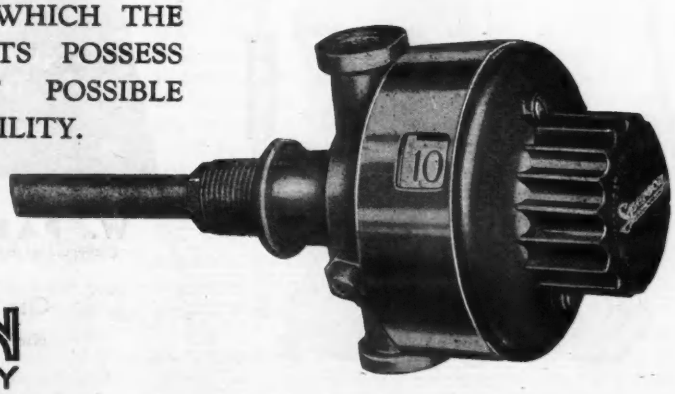

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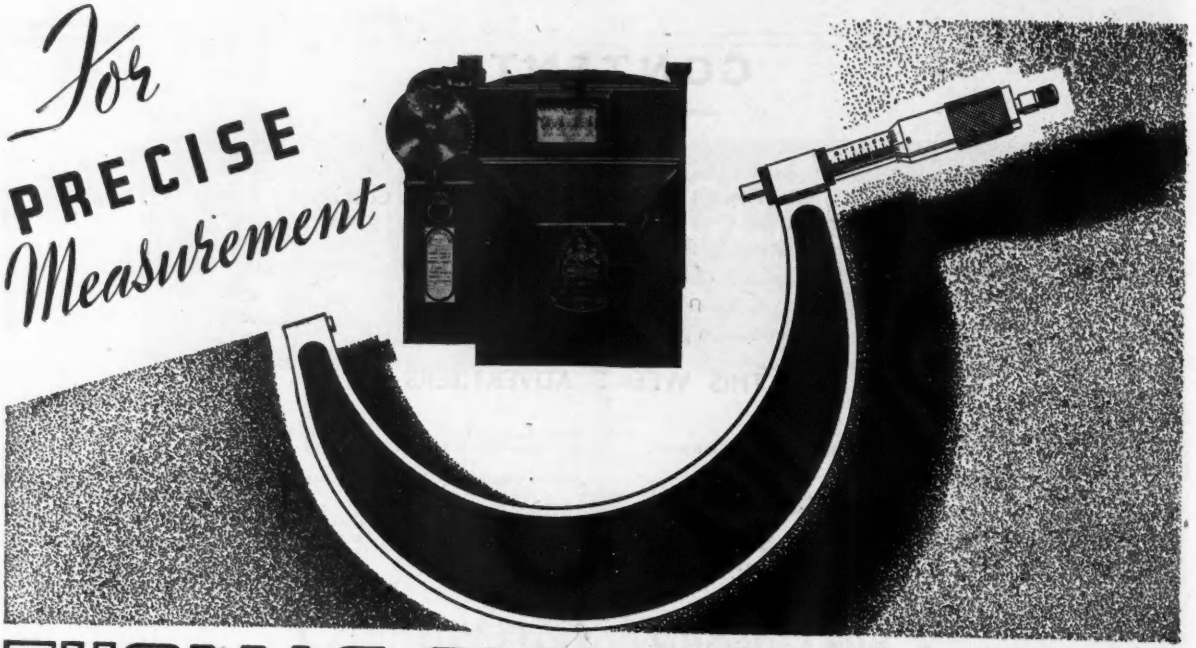

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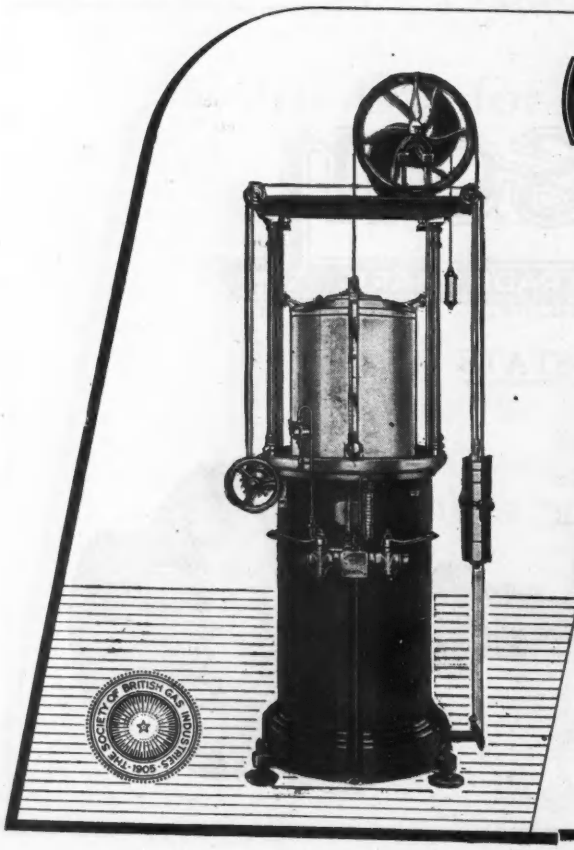

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GAS JOURNAL, AUG. 23, 1944

VOL. 244 96th YEAR No. 4240

EDITORIAL NOTES

EXAMINATION RESULTS

WE give to-day the names of the successful candidates in the 1944 Examinations under the Education Regulations of The Institution of Gas Engineers, and we also publish the report of the Board of Examiners. In spite of the difficult conditions—conditions the reverse of conducive to "examination concentration"—there were more candidates than in 1943, and we are delighted to find that, taken as a whole, the report is in more cheerful vein. This is most encouraging after the unrelieved gloom of the reports over many a past year. Not that the present report pictures a cloudless sky; far from it; there are several dark clouds, but at least there are also welcome patches of blue. The chief grouse, it seems—and it is made by no means for the first time—relates to the inability of candidates to express themselves in line with pen or pencil. In a few instances it is admitted that the sketches were "really excellent"; for the rest the standard was very sketchy indeed, and the examiners urge that candidates should be constantly encouraged by their employers and teachers to practise the sketching of pieces of plant encountered in their daily work. Other major grouses are that most candidates cannot express themselves concisely, that many candidates cannot spell correctly, that there is a tendency to shun mathematics, and that questions concerning the industrial use of gas are most unpopular—which, considering the importance of the subject and the opportunities which the field offers, is surprising. In the matter of sketches, we cannot do better than recommend to studying candidates a series of articles at present running in our monthly publication, "GAS SERVICE," in which that experienced examiner, Mr. R. N. Le Fevre, has been dealing on entirely original lines with the principles involved.

We suppose that when our grandfather or our father was sitting for an examination he was convinced that the standard of the questions set was higher than ever before, and we suppose that he had the same uncomfortable feelings of frustration that we ourselves had—the fight against time and the conviction that never before were the questions so difficult, so tricky, and so different from what we expected. It was, of course, all right for the other fellow. He had swotted-up the subjects requiring answer while we had been cramming others. But neither our forbears or ourselves had the additional discomfort of sitting for examinations in air raid shelters, or even of wondering whether we should reach the examination centre at all. With all this, and bearing in mind the cumulative strain of several weary war years, we think the results of the I.G.E. examinations are quite remarkable, and we should have liked to see some reference to "examination conditions" in the report. In the circumstances it is all the more pleasant to come across expressions such as "great improvement," "very much better," "most satisfactory." We congratulate the winning candidates on their successes, and the examiners on introducing for the first time for many years a more cheerful note in their report.

AN ANGLE OF CO-OPERATION

HOW many times we have emphasized the value of and need for co-operation between the Gas Industry and the architect and builder we do not know. The number is not small, but we have no hesitation in adding to it, for, in view of the necessary building programme after the war, the size of which problem is being increased daily all too rapidly, such co-operation is more needful than ever. In post-war reconstruction the Gas Industry can help enormously, and the benefit the consumer will eventually derive will in part at any rate depend on the extent to which the Industry and the architect and builder can work together in common purpose and in common accord. Expense and inconvenience inevitably result from lack of co-ordination—a point so well brought out in the recent report of the I.G.E. Installations Committee. For example, the cost incurred by having to install a supply of gas after a building has been completed instead of at the time of construction is certainly three times as great, and it may well be much more. And in other directions the community will fail to gain the benefits due to it unless there exists the mutual understanding we have in mind.

Now it is or should be well enough known that the Gas Industry has not in fact lost sight of the all-round advantages—with the spotlight on the consumer aspect—of such understanding. Last year a Consultant Architect, Miss Jane Drew, was appointed. On the Industry's behalf she visited the United States, and now published by the Domestic Heat Services Committee of the British Gas Federation are two reports she has made following an extensive and obviously intensive tour of inspection. A short time ago ("JOURNAL" of Aug. 2, p. 143) we referred in these columns to the current activities of the British Commercial Gas Association, speaking specifically about what we consider a most opportune and appropriate publication having the title *Post-War Homes*—a fresh and informative booklet indicating to what good purpose gas can fit into projected plans. Miss Drew's reports—very well produced, by the way, by the B.G.F.—are complementary and supplementary to the educative effort, which we think is on right lines, being put forward in trying circumstances by the Industry. One of the reports is an account of the visit to America; the other outlines Miss Drew's recommendations to the Industry on the planning and equipment of kitchens in households for families of various sizes and income levels. Both have been issued to gas undertakings, and if they are properly digested—and their contents merit more than casual reading—they are sure to be of practical help in any discussion on post-war housing, not only with local authorities, not only with architects and builders, but with individual consumers. They add notably to what is now becoming a most useful background of original information, the reverse of stale and dry and dusty—added evidence that the Industry is in fact thinking for itself, and is determined to have something to offer which, however it may be criticized, is first-hand and knowledgeable.

Reports of the nature do not mature overnight, of course, and it is of interest to look back for a moment as to the how and why of the reports we are mentioning, and the evolution of the work in general. It is now well over a year since the B.C.G.A. planted the seed of the B.G.F. Domestic Heat Services Committee by appointing a Kitchen Planning Committee (actually in May of 1943) to consider the planning and equipment of kitchens for post-war homes. It was not long before the Committee realized that it should seek guidance from an architect experienced in such matters, and this led to the appointment of Miss Drew. Also it was not long before it was found impracticable to separate the use of gas and coke in the kitchen from the remainder of the household. The terms of reference were widened, and the present B.G.F. Committee came into being. In its new and enlarged form the Committee has tackled wider issues, and its activities have taken it into direct touch with the several Ministries responsible for the post-war housing problem. It would appear to constitute a sure and practical foundation for cultivating that angle of co-operation which we have been discussing.

Coke Quality

A correspondent writes to say that our editorial comment in last week's "JOURNAL" on the future of coke convinces him somewhat against his will, and he goes on to say: "Each and every gas undertaking must lay itself out to give a regular supply to the consumer. This means the installation of a lot of new plant, but more important still, it means the inauguration of a new policy throughout the country, with sufficient compulsion about it to prevent the backward undertaking from 'fouling the nest' of the Industry as a whole. Rotten coke—like rotten gas—in any part of the country gives the commodity a bad name everywhere."

Personal

We greatly regret to learn that, largely owing to the strain of the war years, Mr. WILLIAM T. LANE, J.P., M.I.E.(India), General Manager and Engineer of the Bombay Gas Company, Ltd., has suffered a breakdown in health, and been compelled to tender his resignation. The Directors have sanctioned six months' special leave in connexion with his retirement, which came into operation as from Aug. 1, when his Deputy Manager and Engineer No. 1, Mr. L. W. BOULTER, succeeded him.

In 1939 Mr. Lane was Chief Personal Assistant to Mr. James Eldridge, M.I.C.E., Engineer and Manager of the City of Oxford Gas Company, and the Directors of the Bombay Gas Company appointed him in 1900 as their Assistant Engineer and Manager in Bombay. In 1923 he was made Deputy Manager and Engineer, in 1924 Manager and Engineer, and in 1933 General Manager and Engineer. Therefore, 44 years out of the 50 he has been in the gas profession have been spent in the Tropics. During this period he has been in close contact with many of the leading civil, mechanical, and other engineers in India. He is a Past President of the Bombay Engineering Congress, and was on the Managing Committee for several years prior to its being amalgamated with the Institution of Engineers (India), of which he is an active member at the present time. He has also taken a keen interest in the development of the Institution of Science, which is controlled by the University of Bombay. He is the oldest European resident member of the principal clubs there.

The make of gas when he went to Bombay in 1900 was 130 million cu.ft. per annum, which had risen in the year 1943 to 1,117 millions—this in spite of the Company having to restrict the supply of gas for public street lighting. The demand for gas in Bombay to-day is far in excess of the supply, the industrial load being an ever-increasing one. The works have been operating practically up to maximum production capacity for some considerable time, as it has not been possible to obtain new and additional plant or to purchase the material to make plant to the Company's own design in their own workshops. Neither have they been able to extend the distribution system. It is interesting to note that the works are 1,100 miles away from the collieries, consequently the question of transportation alone is a very serious problem which has caused great anxiety.

Mr. BOULTER joined the Company in 1927, having previously been with the Commercial Gas Company.

Obituary

The death occurred on August 15 of Mr. A. MACKAY, M.I.Mech.E., who gave 27 years' active service to the Stoke-on-Trent Gas Department, retiring from the position of Chief Engineer and General Manager in September of last year. Mr. Mackay's early technical training was with the Glasgow Corporation Gas Department, and for seven years he was Assistant Engineer at the Dawsholm Works. Subsequently he was Engineer and Manager successively at Montrose and Motherwell. When he went to Stoke in 1917 there were four separate works owned by the Corporation, while the central part of the district was supplied from a works owned by a company. Mr. Mackay planned a complete scheme for acquiring the company's works, erecting plant more than to double the capacity of those works, with the necessary distribution system, and closing down the four old works of the Corporation and one of the company's works situated at Tunstall. This was the first gas centralization scheme attempted on such a scale, and it resulted in drastic reductions in the price of gas, with especial repercussions on the industrial load, particularly in pottery firing. Up to the outbreak of war the increase in industrial usage had amounted to 442%.

Mr. Mackay leaves a widow and three daughters. A large number of his friends and business associates attended the cremation at Abbey Hulton, Stoke-on-Trent, on Aug. 18.

* * *

The death occurred on Aug. 12 of Mr. WILLIAM HENRY KITSON, former Gas and Water Engineer at Dereham. Deceased, who was 80, retired in 1936, having served as Manager for 36 years.

Dividends

Gas Consolidation, Ltd.—Final dividend of 2½% actual, less tax on the "A" Ordinary Stock, making with the interim dividend already paid 5% actual, less tax, for the year ended May 31, 1944, and a final dividend of 3% actual, less tax, on the "B" Ordinary Stock, making with the interim already paid 5% actual, less tax, for the year (same).

Metropolitan Gas Company of Melbourne.—Final dividend of 5s. per share.

South-Eastern Gas Corporation, Ltd.—Interim dividend of 1½%, less tax, on the Ordinary Stock, for payment on Sept. 30 (same).

Wellingborough.—Dividends at the same rate as before (7½% on the Original and 6% on the Additional Shares, less income tax) for the half-year.

Diary

Sept. 1.—B.G.F. Domestic Heat Services Committee: Gas Industry House, 2.30 p.m.

Sept. 8.—North British Association of Gas Managers: Annual Meeting, Edinburgh.

Oct. 27.—Manchester District Association of Gas Engineers: Autumn General Meeting.

Science in the Universities

In a report on "Science in the Universities" submitted by the Association of Scientific Workers to the University Grants Committee of the Treasury, it is recommended that in degree courses, general studies should occupy the first two years, two further years leading to a Special or General Honours degree, the fourth year to include an introduction to research. More science, especially biology, should be included in courses for all teachers. Courses in science, its method and social implications, ought to be part of the curriculum for all non-scientists.

Syllabuses in the particular sciences need bringing up-to-date, and especially lightened of factual detail so that basic principles are brought out. Representative advisory bodies for this purpose are advocated. Vacation practical work should be part of the syllabus for all scientists, not only for those training for industry.

A balance between teaching and research must be preserved in the post-war period of reorganization. To give other universities the same provision for teaching and research as at Oxford, an increase of two-thirds in staff and one-third in expenditure will be needed over 1939 figures, for the same student population. Salaries should in any case be raised to parity with the prestige of university teaching; specific proposals on this are set out in an Appendix.

(The report is obtainable from the Association, at Hanover House, 73, High Holborn, London, W.C. 1, price 1s.)

All Communications for the Chief Alkali Inspector should in future be addressed to the Ministry of Health, Whitehall, S.W. 1, instead of to Cornwall House, Stamford Street, S.E. 1.

The Annual General Meeting of the North British Association of Gas Managers will be held in the Freemasons' Hall, George Street, Edinburgh, on Sept. 8, when Papers will be submitted by Messrs. H. S. Milne, B.Sc.(Eng.), Aberdeen, and W. A. Currie, Renfrew. The Lord Provost, Magistrates, and Councillors of Edinburgh have extended a cordial invitation to members and friends attending the meeting to lunch with them in the Freemasons' Hall at 1 p.m. By courtesy of the Edinburgh Corporation Gas Department, the Annual Bowling Competition will take place on the Department's Bowling Green at Granton on Sept. 7 at 2 p.m.

The Fine Work of the Cambridge Gas Company's Gas-Works Ambulance Division was recognized at a recent meeting, when the President of the Division, Mr. J. Hunter Rioch (General Manager and Secretary), presided, and voiced the thanks of the Company for the first-class service which members of the Brigade had rendered in handling casualties sustained in the course of the daily work. He was glad to know that employees had complete confidence in the members of the Division and in their competence to handle emergencies. Evidence of their efficiency was provided by Ambulance Officer S. A. Mann, who reported that of the large number of cases dealt with since the Division was formed in 1940 there had never been a single instance of complications arising after first-aid treatment by members. Awards gained during the year were presented by the County Surgeon, Dr. C. W. Walker, who said that from what he had seen it was obvious that the Gas-Works Division was efficient.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

Institution of Gas Engineers

Results of 1944 Examinations

The undermentioned candidates were successful in the 1944 Examinations in Gas Engineering (Manufacture) and Gas Engineering (Supply) of The Institution of Gas Engineers, held under the Education Regulations of the Institution.

EXTERNAL CANDIDATES (44).

Diploma in Gas Engineering (Manufacture) (3).

Class.	Name.	Town.
Second ...	Bentley, G. A. ...	Elland
,, ...	Henry, J. A. ...	Hinckley
,, ...	Longhurst, R. S. ...	Rochdale

Higher Grade Certificate in Gas Engineering (Manufacture) (12).

Class.	Name.	Town.
First ...	*Culshaw, G. W. ...	Liverpool
,, ...	Hoyle, Gilbert ...	Elland
Second ...	Allen, L. K. ...	Earley
,, ...	Barlow, J. C. R. ...	Stoke-on-Trent
,, ...	Bignell, W. G. ...	Eastbourne
,, ...	Crathorn S. C. ...	Birmingham
,, ...	Grocott, F. ...	Birmingham
,, ...	Owen, W. H. ...	Hemel Hempstead
,, ...	Richmond, F. ...	Aylestone
,, ...	Smith, B. C. ...	Halifax
,, ...	Spiller, W. J. ...	Paignton
,, ...	Williams, A. S. ...	Teddington

Ordinary Grade Certificate in Gas Engineering (Manufacture) (10).

Class.	Name.	Town.
Second ...	Chignell, P. A. ...	Tenbury Wells
,, ...	Croxton, H. ...	Bristol
,, ...	Martin, H. ...	Havant
,, ...	Maunder, D. J. ...	Paignton
,, ...	Mitchell, R. B. ...	Prescot
,, ...	Nickeas, R. D. ...	Prescot
,, ...	Platt, R. E. ...	Birkenhead
,, ...	Purcell, J. G. ...	Norwich
,, ...	Trevelyan, P. ...	Exmouth
,, ...	Yates, A. ...	Coventry

Ordinary Grade (Single Subject) Examination in Gas Engineering (Manufacture) to qualify to sit for the Diploma Examination in Gas Engineering (Supply) (2).

Class.	Name.	Town.
First ...	Harrison, R. K. ...	Southampton
,, ...	Nicholson, T. A. ...	Weston-super-Mare

Diploma in Gas Engineering (Supply) (2).

Class.	Name.	Town.
First ...	Partington, H. ...	Rochdale
Second ...	Derbyshire, J. A. ...	Gainsborough

Higher Grade Certificate in Gas Engineering (Supply) (6).

Class.	Name.	Town.
First ...	*Harvey, F. ...	Wolverhampton
,, ...	Whitestone, P. D. ...	East Dulwich
Second ...	Birks, H. E. S. ...	Spalding
,, ...	Brown, W. ...	Buckhaven
,, ...	Herbert, W. H. ...	Bristol
,, ...	Hoskin, J. ...	Southampton

Ordinary Grade Certificate in Gas Engineering (Supply) (6).

Class.	Name.	Town.
First ...	*Collieson, A. F. ...	Wallasey
Second ...	Annakin, E. ...	Harrogate
,, ...	Atkin, R. J. ...	Nottingham
,, ...	Burkett, E. C. ...	Harrogate
,, ...	Dyer, A. H. ...	Newport, Mon.
,, ...	Surman, H. J. ...	Cheltenham

Ordinary Grade (Single Subject) Examination in Gas Engineering (Supply) to qualify to sit for the Diploma Examination in Gas Engineering (Manufacture) (3).

Class.	Name.	Town.
First ...	Stewart, E. R. ...	Romford
,, ...	*Sweeting, K. J. ...	Taunton
,, ...	Taylor, J. A. ...	Derby

INTERNAL CANDIDATES (40).

Higher Grade Certificate in Gas Engineering (Manufacture) (12).

Class.	Name.	Centre.
First ...	Tait, S. A. ...	Newcastle-upon-Tyne
Second ...	Allcock, W. ...	Manchester
,, ...	Barker, G. F. L. ...	Huddersfield
,, ...	Campbell, A. ...	Glasgow
,, ...	Cummings, W. ...	Newcastle-upon-Tyne
,, ...	Faulkner, E. L. ...	Manchester
,, ...	Gallaher, P. E. ...	Birmingham
,, ...	Kinnon, J. H. ...	Glasgow
,, ...	Metcalfe, F. T. ...	Manchester
,, ...	Mitchell, A. R. ...	Newcastle-upon-Tyne
,, ...	Mitchell, J. V. ...	Halifax
,, ...	Ridley, N. ...	Newcastle-upon-Tyne

Ordinary Grade Certificate in Gas Engineering (Manufacture) (20).

Class.	Name.	Centre.
First ...	Briggs, A. B. ...	Edinburgh
,, ...	Campbell, J. D. ...	Edinburgh
,, ...	Elgin, D. C. ...	Edinburgh
,, ...	Whitney, W. E. ...	Dudley and Staffordshire
Second ...	Booth, J. C. W. ...	Rotherham
,, ...	Cleaver, R. ...	Bradford
,, ...	Drummond, J. ...	Glasgow
,, ...	Holmes, G. W. R. ...	Manchester
,, ...	Hull, M. F. ...	Leicester
,, ...	Mather, L. R. ...	Bradford
,, ...	Millington, J. ...	Manchester
,, ...	Morton, W. ...	Edinburgh
,, ...	Oliver, J. C. ...	Newcastle-upon-Tyne
,, ...	Preston, A. G. ...	Glasgow
,, ...	Rendle, F. R. ...	Plymouth and Devonport
,, ...	Rudge, D. F. ...	Leicester
,, ...	Stokes, D. B. ...	Huddersfield
,, ...	Thomas, D. ...	Bradford
,, ...	Williams, E. C. ...	Rotherham
,, ...	Wood, H. A. ...	Newcastle-upon-Tyne

Higher Grade Certificate in Gas Engineering (Supply) (1).

Class.	Name.	Centre.
Second ...	Fitzsimmons, W. A. ...	Bradford

Ordinary Grade Certificate in Gas Engineering (Supply) (6).

Class.	Name.	Centre.
First ...	Elgin, D. C. ...	Edinburgh
,, ...	Nye, A. ...	Westminster
Second ...	Briggs, A. B. ...	Edinburgh
,, ...	Campbell, J. D. ...	Edinburgh
,, ...	Holden, R. A. J. ...	Brighton
,, ...	Searle, A. F. ...	Bournemouth

Ordinary Grade (Single Subject) Examination in Gas Engineering (Supply) to qualify to sit for the Diploma Examination in Gas Engineering (Manufacture) (1).

Class.	Name.	Centre.
First ...	Harrison, B. H. ...	Leicester

* Denotes Candidate obtained a Distinction in the Main Subject Examination.

REPORT OF THE BOARD OF EXAMINERS

During the year 1943–44 the members of the Board of Examiners and Assessors, appointed by the Council, were:

Major Courses. — Examiners: G. H. Kenyon, M.Sc.(Tech.), (Sheerness); W. R. Branson, M.Sc. (Cardiff); F. Dawson, B.Sc., Assoc.M.Inst.C.E. (London); G. Dougill, M.Sc., A.R.I.C. (London); A. McDonald, B.Sc., A.R.T.C., A.R.I.C. (Wakefield); H. S. Milne, B.Sc.(Eng.) (Aberdeen); E. O. Rose, B.Sc., Assoc.M.Inst.C.E. (London); H. H. Thomas, B.Sc. (Liverpool)—Gas Engineering (Manufacture). J. H. Dyde, M.Sc. (Uxbridge); W. A. Bishop (Croydon); J. E. Davis, F.R.I.C. (London); D. C. Gunn, B.Sc.(Eng.) (Leeds); A. C. Rea, M.I.Mech.E. (Bath); W. N. Smirles, B.Sc. (Birmingham); W. K. Tate, M.A., Assoc. M.Inst.C.E. (London); J. E. White (Newcastle-upon-Tyne)—Gas Engineering (Supply).

Assessors: Gas Engineering (Manufacture) and (Supply). West of Scotland: David Fulton (Helensburgh); Sydney Smith (Paisley). East of Scotland: D. D. Melvin (Edinburgh); J. W. Napier, M.B.E. (Dunkeld).

Minor Course and Gasfitting Courses.—Examiners: E. F. Keable (Worksop)—Gas Supply Practice. A. G. R. Kennett (Margate), R. N. Le Fevre (London), J. Robertson (London)—Gasfitting. A. Marsden, M.Sc., F.R.I.C., M.I.Chem.E., F.Inst.F. (Bristol)—Elementary Science.

Examinations, 1944.

The results of this year's Examinations, on the whole, show considerable improvement, particularly on the Supply side.

Although sketching was rather better than in previous years, the Board of Examiners feels that the standard is still far below that expected, and finds it necessary to emphasize again the comments made on this subject in last year's Report; particular mention might be made of the fact that sketches generally are far too small and lack proportion. The Examiners recommend that general arrangement diagrams should be on a generous scale, and that these should be supplemented by separate detailed diagrams where necessary. Candidates should be constantly encouraged by their employers and teachers to practise the sketching of pieces of plant encountered in their daily work.

The total number of candidates entering for the Examinations is greater by nineteen than last year, although the number of Diploma candidates is lower.

There has been a marked improvement in the standard of the Ordinary Grade candidates, but there are still many who cannot spell correctly, and the ability to express ideas concisely is sadly lacking.

In the case of the Ordinary Grade Examination in Gas Engineering (Manufacture) questions involving calculations were well answered, although this was not the case in the other examinations. Again, the Board of Examiners would stress the importance of mathematics, and would emphasize the desirability of giving greater attention to this subject.

Comparative Schedule of Examination Candidates.

Subject.	Grade.	1943. Internal.	1943. External.	1944. Internal.	1944. External.
I.	II.	III.	IV.	V.	VI.
Gas Engineering (Manufacture) ...	Ordinary ...	29	30	38	26
	Higher ...	22	23	19	28
	Diploma ...	—	12	—	10
Gas Engineering (Supply) ...	Ordinary ...	7	12	14	28
	Higher ...	7	12	5	9
	Diploma ...	—	7	—	3
Certificate in Gas Supply ...	...	—	—	—	—
Total ...	... ...	65	96	76	104
Grand total ...	...	161		180	

Ordinary Grade Gas Engineering (Manufacture).

Number of candidates who sat for the Examination:

Class.	Internal—38. No.	Internal—38. %.	External—26. No.	External—26. %.	Total—64. No.	Total—64. %.
1st	5	13.2	9	34.6	14	21.8
2nd	17	44.7	15	57.7	32	50.0
Fail	16	42.1	2	7.7	18	28.2

The total number of candidates entering for the examination was almost the same as last year, but whereas there were fewer External candidates, there were nine more Internal candidates. The results show a great improvement, the number of failures being only 28% against 48% last year, with the first class passes increasing from 7% to 22%. The External candidates' results were very much better than those of candidates entered internally, and it is pleasing to note that the question which was most satisfactorily answered was the one involving arithmetic calculations; there are still many candidates, however, who do not appear to be able to solve problems of this kind. Sketching generally showed improvement, but is still below the standard expected.

Higher Grade Gas Engineering (Manufacture).

Number of candidates who sat for the Examination:

Class.	Internal—19. No.	Internal—19. %.	External—28. No.	External—28. %.	Total—47. No.	Total—47. %.
1st, with distinction ...	0	0	1	3.5	1	2.1
1st	1	5.3	1	3.5	2	4.3
2nd	13	68.5	10	35.7	23	48.9
Fail	5	26.2	16	57.3	21	44.7

The number of candidates entering for the examination was three more than last year. The results are a little better, but are still rather disappointing, the questions involving calculations being again badly answered, while there is a lack of clear thinking and, consequently, of concise expression. The answers to the question on sampling showed a surprising absence of the knowledge of the principles involved in the taking of representative samples. Sketches again were very poor, the tendency being to make these far too small, and few candidates made a general sketch showing detail on separate sketches to a larger scale.

Diploma Grade Gas Engineering (Manufacture).

Ten candidates entered for this examination, of whom five took the Home Paper and two submitted Theses. Of the remaining three candidates, two re-took the Written Examination only, and the third submitted the Home Paper only. The following are the results in the Written Examination:

1st Class ... ... 0 = 0%
2nd Class ... ... 8 = 88.9%
Fail ... ... 1 = 11.1%

In a few cases really excellent sketches were made, but the remainder were very poor, while there was a tendency to avoid questions requiring calculation, and an aversion to giving direct statements or dimensions, even when expressly requested.

Of the six candidates taking the Home Paper, two gave good answers and were awarded first class passes. The remaining four candidates failed, and except in the case of the two first class candidates the answers submitted were vague and too general in character, displaying little technical knowledge.

Ordinary Grade Gas Engineering (Supply).

Number of candidates who sat for the Examination:

Class.	Internal—14. No.	Internal—14. %.	External—28. No.	External—28. %.	Total—42. No.	Total—42. %.
1st, with distinction ...	1	7.1	2	7.2	3	7.1
1st	2	14.3	3	10.7	5	11.9
2nd	6	42.9	14	50.0	20	47.7
Fail	5	35.7	9	32.1	14	33.3

The number of candidates entering for the examination both internally and externally was approximately twice as great as last year, and there was a marked improvement in the results. Three candidates obtained distinction, the first class passes increased from 6% to 12% and the percentage of failures was lower (33% against 40% last year). Sketching showed some improvement, but many candidates lack the ability to express their ideas clearly, and spelling was frequently very bad.

The industrial question was most unpopular, only one candidate attempting to answer it.

Higher Grade Gas Engineering (Supply).

Number of candidates who sat for the Examination:

Class.	Internal—5. No.	Internal—5. %.	External—9. No.	External—9. %.	Total—14. No.	Total—14. %.
1st, with distinction ...	0	0	1	11.1	1	7.1
1st	0	0	1	11.1	1	7.1
2nd	1	20.0	4	44.5	5	35.8
Fail	4	80.0	3	33.3	7	50.0

Fewer candidates entered this year than last, but the results as a whole are better, one candidate obtaining distinction and two obtaining first class passes. Although the number of failures has decreased from 68% to 50%, the results cannot be viewed with any equanimity, and it is disappointing to note that the results obtained by the candidates entering internally were very poor indeed, only one of the five obtaining a second class pass, the remaining four failing.

The sketching, for which there was not perhaps so much scope as usual, is rather better, and in one particular instance very good indeed. Composition and spelling are at a higher level then in recent times, and Part II of the Examination attracted a much better average mark than Part I. Broadly speaking, the questions concerned with main-laying practice and calculations were badly answered, many candidates showing an inability to work out calculations correctly, while the implications of the problems on the practical side were not realized. The gas engine and public lighting questions were well answered by the few who attempted them, as was the question on meter defects, but for some reason the industrial question was avoided by everybody. This is all the more remarkable, since the Examiners have been led to believe that there is a definite demand for such a type of problem; but, on the other hand, many candidates showed a good knowledge of combustion calculations and the theory of jets.

Diploma Grade Gas Engineering (Supply).

Three candidates entered for this examination. Two took the Home Paper, one presenting a model answer, while the third candidate re-submitted a Thesis, gaining a second class pass.

Minor Course Examination in Gas Supply Practice and Gasfitting.

The detailed reports of the Examiners of the City and Guilds of London Institute in Gas Supply Practice and Gasfitting are not yet available, but the following figures show the number of candidates who entered and passed:

Gas Supply Practice: 6 candidates entered—1 first class, 2 second class, 3 failed.

Gasfitting, Grade I: 141 candidates entered—55 passed, 86 failed.

Gasfitting, Grade II: 84 candidates entered—3 1st/Distinction, 28 first class, 26 second class, 27 failed.

Gasfitting, Final Grade: 56 candidates entered—12 first class, 29 second class, 15 failed.

Coal Tar Paint

Paints having excellent waterproofing qualities may be produced from coal tar by thinning coal tar pitch with coal tar distillate of suitable solvent properties and suitable volatility.

The importance of waterproofing qualities in protecting steel-work against corrosion has led to the wide use of these paints, although they suffer from rather serious defects. In order that the paint may be easily applied with a brush it is necessary to reduce its viscosity to such a point that the thickness of the paint film is apt to be inadequate, and after application the paint may run in hot weather. The surface film dries and hardens mainly by volatilization of the thinning solvent, but also in part by atmospheric oxidation. In the course of this hardening tar paints frequently develop cracks which form a network over the surface, a phenomenon known as reticulation or crocodiling. The film which remains after evaporation of the thinning solvent tends to become brittle and readily detached from the metal surface.

To overcome these disadvantages is the object of a patent (No. 560,390) taken out by the South Metropolitan Gas Company and G. H. Fuidge. The process involves a preliminary treatment of coal tar pitch at a temperature ranging from 180°–230°C. with oxygen or air, or with a small proportion of sulphur, whereby its melting-point is raised. The treated pitch is then fluxed with relatively small proportions of a vegetable oil and of a coal tar oil containing a substantial amount of material boiling above 300°C., and a suitable proportion of a finely divided solid filler is incorporated in the mixture. Finally the composition so obtained is thinned to a consistency suitable for painting by the addition of crude coal tar naphtha containing at least 2% by weight of coal tar bases.

A suitable parent material for the invention is a medium soft coal tar pitch having a melting-point of about 80°C. (determined by the ring and ball method). The treatment of this material with air or oxygen, or with sulphur, at about 200°C. should be continued until the melting-point is raised to within the range of about 95°–120°C.; in the case of the treatment with sulphur this will require about 1½–3% of sulphur, calculated on the weight of the pitch.

The proportion of coal tar oil incorporated in the treated pitch should be such that the mixture contains 3–12% by weight of coal tar oil boiling above 300°C., and the proportion of the vegetable oil should amount to 5–15% by weight, both these percentages being calculated on the weight of the final composition (including the filler) before thinning with coal tar naphtha. It is convenient to use as the coal tar oil an anthracene oil boiling mainly above 300°C., but a creosote oil containing at least 20% of oil boiling above 300°C. may alternatively be used. The vegetable oil may be a so-called drying oil which hardens on exposure to air, or it may be an oil which does not exhibit this property.

The proportion of filler should be such as will impart to the finished paint the necessary free brushing properties and freedom from running; a suitable proportion is 5–15% by weight, calculated on the final composition before thinning. Lamp black and kieselguhr may be named as examples of suitable fillers.

As stated, for thinning the mixture of treated pitch with oils and filler to painting consistency there is used a crude tar naphtha containing tar bases to the extent of at least 2% by weight. Should the crude coal tar naphtha not already contain sufficient tar bases an additional quantity may be added in the form of crude pyridine bases. When an anthracene oil of the kind described is used as the coal tar oil, 30–45% by weight of naphtha (calculated on the final paint after thinning) is required in order to give the desired viscosity; and when creosote oil is used, the proportion of naphtha required is slightly less. The exact proportion can readily be determined by test.

Since a paint prepared in accordance with the invention possesses abnormal viscosity characteristics, it cannot be tested by instruments which depend on the measurement of the rate of flow through an orifice. The viscosity tests are therefore carried out by means of a falling float apparatus, similar in design to that of the Hutchisson junior tar tester, but having a much smaller weight—namely about 15 grammes. The procedure is as follows:

The paint is thoroughly worked by stirring and the consistency is then determined at a temperature of 77°F. by means of the float. The time of fall is required to be about 8 to 10 seconds. The paint is then allowed to remain quiescent for five minutes at the same temperature, and the viscosity determination is repeated without further stirring. The time of fall in the latter test is required to be at least twice that in the original test.

The following example illustrates the process:

Medium soft pitch (melting-point 80°C. by the ring and ball method) was melted and heated to 200°C. in a vessel having a stirring device. 2% by weight of flowers of sulphur was added, and stirring was continued until evolution of sulphuretted hydrogen had ceased. The treated pitch on testing was found to have a melting-point of 110°C. by the ring and ball method. To the treated pitch, while still molten, were added 10% of castor oil seconds, 6% of anthracene oil (containing 80% boiling above 300°C.) and 7% of lamp black, the percentages all being calculated on the weight of the mixture before the thinning. Stirring was continued until the ingredients were thoroughly incorporated. Crude coal tar naphtha to B.S.S. 479 E. containing 2.5% by weight of tar bases was then added in quantity amounting to 30% by weight of the final thinned mixture. A sample was withdrawn and tested for viscosity at 77°F. by means of the falling float viscometer described. The time of fall was found to be 20 seconds, which was excessive. Accordingly a further 5% by weight of coal tar naphtha was added, and on a further viscosity test the time of fall of the float at 77°F. after the paint had been worked was found to be 9.5 seconds, which was satisfactory. After the paint had been allowed to remain quiescent for 5 minutes at the same temperature the time of fall of the float was found to be 23 seconds.

Production of Road Tars

(*Concluded from p. 221*)

The statement that embrittlement is shown at "below −5°C." means that cooling was only carried down to this temperature, and that the material had not then become brittle.

In each case the sludge residue, when mixed with the road tar, had an oiling-back effect greater than would be expected from its viscosity/temperature characteristics. Table I shows that the addition of about 10 parts by weight of sludge residue to 90 parts by weight of road tar (or 10 parts of sludge residue to 75 parts by volume of road tar) produces a non-embrittling material, but does not change greatly the viscosity and other characteristics of the road tar. The sludge residue appears to be miscible with the road tar in all proportions.

Addition of "Still Grease" to Road Tar.—This example shows the results obtainable by the addition of the product described above as "still grease" to a road tar. The still grease used was reddish brown, it had a K. & S. softening point of 43°C., and a penetration at 25°C. of 64. Its water content was 1.9% by weight, and embrittlement was not shown at −5°C. A blend of 20 parts of still grease, and 80 parts of road tar, by weight, had the following properties:

Viscosity at 30°C. (B.R.T.A.)	250 sec.
Distillation, % by weight to 200°C.	0.9%
200–270°C.	7.6%
270–300°C.	4.1%
K. & S. softening point of residue from distillation to 300°C.	42°C.
Embrittlement shown at between 0 and −5°C.	

The addition of still grease increases the viscosity of the road tar to approximately the same extent as does an equal amount of 65 penetration bitumen, but appears to have a more marked effect in reducing the tendency to embrittlement. If it is desired to obtain a final product having a viscosity similar to that of the original tar, then an initial tar having a considerably lower viscosity would be employed in the mixture, so that the increase in viscosity caused by the still grease would raise the viscosity to the desired degree. Still grease appears to be miscible in all proportions with the road tar employed.

Addition of Crude Shale Wax to a Road Tar.—The crude paraffin wax obtained from shale tar as indicated above, and used in this example, had the following properties:

Colour: Light brown; dark greenish when molten.
Pour point: 40.5°C.

A blend of 5 parts of the crude paraffin wax with 95 parts, by weight, of the road tar described above, had the following characteristics:

Viscosity at 30°C. (B.R.T.A.)	10.5 sec.
Distillation, % by weight to 200°C.	0.5%
200–270°C.	10.0%
270–300°C.	4.4%
K. & S. softening point of residue from distillation to 300°C.	30°C.
Embrittlement shown at below −5°C.	

The mixture showed a very noticeable "bloom," although no signs of immiscibility could be detected. The drying properties of the tar, so far as could be judged, were not affected by the addition of this amount of crude paraffin wax.

The addition of paraffin wax reduces the viscosity of the mixture to below that of the original tar, and consequently in order to obtain a final product having this viscosity, a road tar of higher initial viscosity would be employed.

In a Preface to the 1944 edition of the *Year Book of the Coke Oven Managers' Association*—its Silver Jubilee number—the Editorial Committee records that the Association continues to expand, both numerically and in the progress of the work being carried out in the national effort. The *Year Book* as usual affords a valuable record of the transactions of the Association and its Sections, and includes the questions set in the City and Guilds of London Institute examinations and extracts from the examiners' reports. Sectional meetings report good attendances during the year and the quality of the Papers presented continues high. The Technical Research Advisory Committee appears to be making headway, and it is anticipated that co-operation with other research organizations will occur in the near future.

Gas Cooking Research

In the following extracts from a Paper by K. R. Knapp, Chief Engineer, American Gas Association Testing Laboratories, various important factors affecting oven performance are briefly discussed and the manner in which constructional features affect them are described. Results of studies of insulating materials are given showing the effects of thickness and density on pre-heating speed and maintaining rate as well as influence on surface and room temperatures. Relationships are outlined between grilling speed and temperature, as well as the influence of type of burner and use of radiants on the griller product.

ABILITY of modern gas range ovens to perform to the best advantage the services demanded of them depends on a variety of factors, which must be properly co-ordinated to secure best results. Some may be solved by following generally accepted methods of oven design. Others are of a much more complex nature and require thorough scientific analysis for their solution. Among these may be mentioned such features as speed of oven heating, economy of operation, maintenance of low surface temperatures, cooler kitchens, and uniform oven heat distribution. All are intimately related with aeration and venting of the oven.

Recognizing the need for fundamental information on these complex elements of performance and design, the Committee on Domestic Gas Research of the American Gas Association included intensive studies of ovens and grillers as a part of its programme on domestic gas cooking research undertaken at the Testing Laboratories in 1935.

Earlier studies on gas range ovens and grillers were devoted largely to determining effects of flue losses, methods of insulation, and input rates on preheating speeds and gas consumption for preheating as well as for maintaining temperatures. Much of the data developed applied also to griller sections. In addition, valuable information was secured on effects of type of flame on griller speeds and temperatures, as well as influence of temperature on quality of grilled meat.

Oven Preheating Speed

Studies of a number of different oven designs showed that increase in input rating was accompanied by a decrease in preheating time. The extent to which this took place in evident from the fact that, using average data, an increase in input rating of 100% produced a 35% decrease in preheating time. By use of a special test oven a much greater decrease was found possible, thus indicating that a number of its constructional features had considerable bearing on preheating speed. It was also established that an increase in input rate, other conditions remaining constant, caused a decrease in excess air, so that at a given oven temperature about the same total volume of flue gases was discharged from the flue outlet. On the other hand, to maintain constant aeration the flue outlet area must be increased proportionately as input increases. With a given oven, therefore, input rate has a dual effect on preheating time, for the reason that more heat is released for heating up the oven, while a smaller percentage of flue loss results due to decrease in excess air. For example, a newly designed oven may be found to have adequate aeration for satisfactory combustion, but too long a preheat time. The speed may be increased by increasing the input rate. The secondary air might, however, be reduced to a point where poor combustion would result, thus requiring design changes such as enlargement of the flue outlet to obtain sufficient excess air.

Preheating time is affected to a much greater extent by changes in input rate than is the maintaining rate. For this reason it may be assumed that satisfactory overall performance can be obtained with an input rate sufficient to provide a reasonably high preheating speed without regarding the effect of input on maintaining rate. Preheating speeds which assure maximum satisfaction to the customer can therefore be used without requiring an appreciably larger gas consumption.

Using the experimental oven previously referred to, effects on preheating time and excess air of various constructional features were successively studied. These included area of secondary air openings in the extreme bottom, passages through the oven bottom above the burner, free area of interior flueways, flue size and location. It was shown that secondary air openings in the bottom larger than 2½ times that of the flue outlet had little effect on preheating time or excess air. Smaller openings, however, restricted flue gas flow. In the case of flue passages in the oven bottoms above the burner no appreciable effect on preheat time or excess air resulted when such openings were at least four times that of the flue outlet. Similarly, areas of flueways through side racks for introduction of flue gases into the oven did not affect preheating time or excess air when they were more than four times that of the flue outlet. On the other hand, cross-sectional area of top flueways for discharge of flue gases from the oven were required to be not less than 1¼ times that of the flue outlet in order that preheating time would not be affected.

Numerous tests were made where flue outlet area, flue height above burner ports and input rates were varied, with other construction features maintained constant. Maximum values of secondary air openings in oven bottoms and interior flueways were employed to minimize the effect of these features. Changes in oven construction of the nature described, which increased excess air, also caused a definite increasei n preheating time and preheating input. It is evident that excess air exerts the same effect on preheating input as on preheating time; therefore, one may be taken as an indication of the other.

Data were obtained prepared to show changes in flue outlet area and height above burner ports which produced changes in excess air with corresponding changes in preheating time for different input rates. In all cases the maximum secondary air and bottom sheet openings and internal flue passages were used (maximum secondary air opening 24 in. ; maximum oven bottom opening 40 in.). A definite relationship exists between the factors shown. An approximate form of equation expressing this relationship is as follows:

$$A = \frac{I \times E^{0.908}}{15{,}580\,(6.37 + H)} \quad (1)$$

Where:

A = flue outlet area, sq.in.
I = input rate, B.Th.U. per hour.
E = excess air, % of that theoretically required for complete combustion, and
H = height of centre line of flue outlet above burner ports, in.

The relationship shown by this formula is apparently applicable to any type of venting and aeration which is generally employed in ovens of the direct-fired type. This statement is premised on the provision that limiting areas for secondary air admission, flue passages through oven bottoms and internal flueways are not less than the values previously indicated.

Oven Aeration and Venting

Relationships between certain operating characteristics and various oven design features have previously been indicated. The following method may be employed in applying them to the best advantage in the design of a particular oven.

Use may be made of equation (1) for determining any one of the factors indicated. Ordinarily the input rate "I" can readily be determined on the basis of the oven volume or by limitations of the capacity of the burner. General oven design will establish the height of the flue outlet "H." Excess air "E" should be the minimum consistent with good combustion. With these factors all known, the flue outlet area "A" would represent the remaining variable. This represents the feature of range construction which would most readily be changed if alterations were later necessary.

$$A = \frac{I \times E^{0.908}}{15{,}580\,(6.37 + H)}$$

Where:

I = input rate, B.Th.U. per hour.
A = flue outlet area, sq.in.
E = excessive % of heat theoretically required for combustion.
H = height of centre line of flue outlet above burner ports, in.

In arriving at a value for excess air, it should be kept in mind that some flue gas leakage will occur in all instances. Combustion data from many sources indicate an average value of 150% for excess air may be used for the ordinary oven with a common burner for the grilling and baking sections. If the baking oven only is involved and secondary air is admitted directly to the combustion zone, this figure may be reduced to 0·5%. Whichever figure is employed, it is desirable to use a factor of 0·8 in order to allow for leakage of flue gases such as usually takes place. In this manner the proper figure would be employed for the purpose of the formula.

When the flue area is determined by use of the formula, approximate minimum values may be set for area of secondary air openings, passageways through the oven bottom and side linings and top flue space. As the areas so selected represent minimum values, they can usually be exceeded without increasing the amount of excess air or reducing speed of operation. Usually these areas are fully adequate, but if it should be necessary to secure additional secondary air, this can readily be done by the comparatively simple expedient of enlarging the flue outlet.

Use can also be made of equation (1) as for determining the maximum input rate which a given oven design may accommodate without undue reduction of excess air. In fact, excess air represents one of the most important factors to be considered in view of its influence on the performance of the oven.

Substantial decreases in flue losses during maintenance periods may be effected by decreasing the percentage of excess air at normal input rate. Such an arrangement, however, would not be desirable, since the excess air might be reduced to such a point that sufficient flexibility would not be provided to meet various operating conditions. A possible way of meeting this objection consists in the use of some automatic means for providing flue restriction during the maintenance period. If by such means excess air during this period would be held to the same value as that at normal input rate, then the flue loss would be substantially decreased. Practicability of accomplishing this result has been demonstrated by a number of oven tests under different conditions, material reductions in maintaining rates resulting.

(To be continued)

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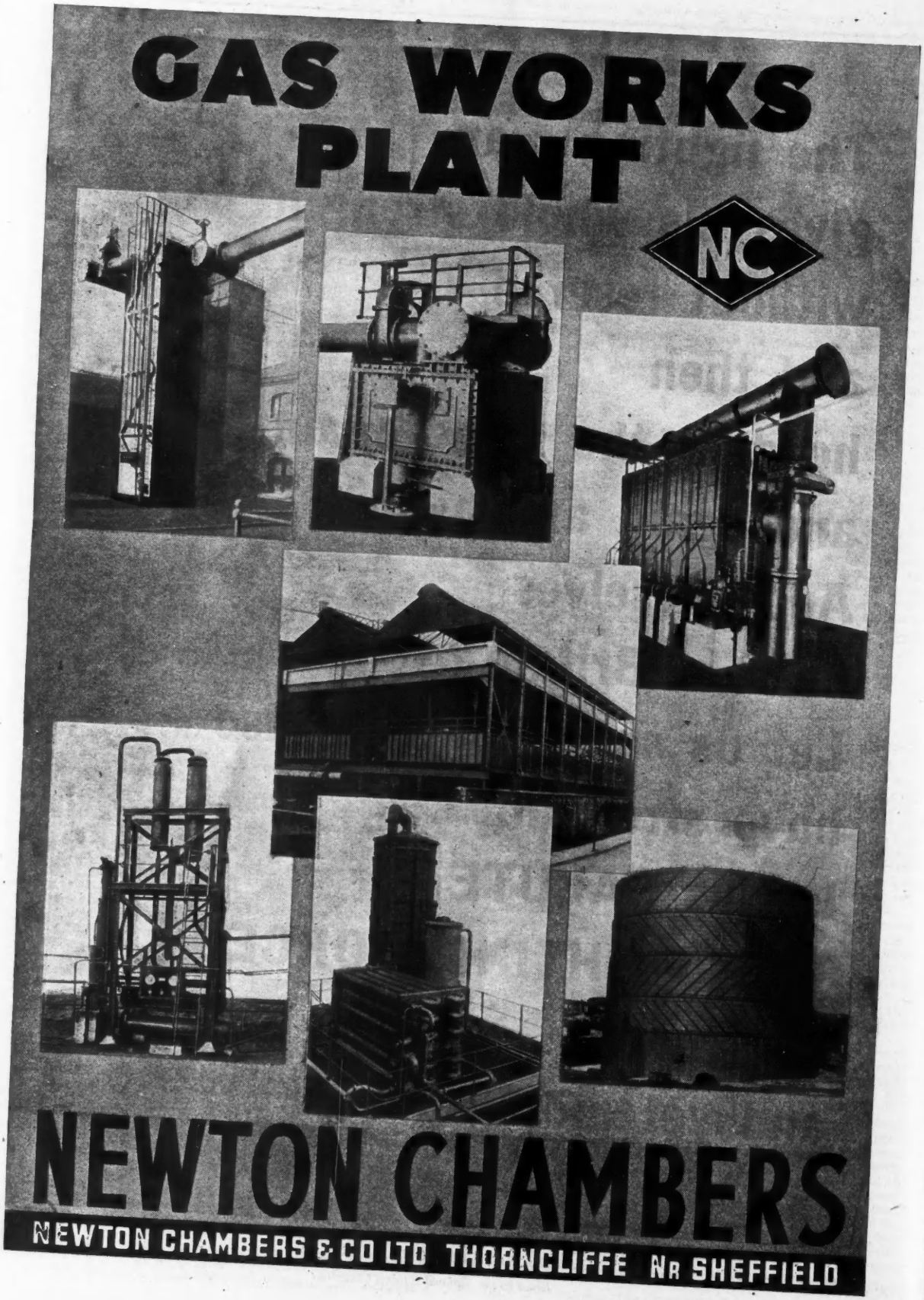
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Complete Gasification of Coal*

By GEORGE HELPS

THE following figures are taken as basis:

C.V. of coal per ton	300 therms.
Cost of coal per ton	35s.
Gas therms produced for sale per ton	67½
Gas coke	9½ cwt.
Gas tar	2 cwt.
Selling price per gas therm	8d.
Selling price of coke per ton	37s.

During the period of candle power standard for gas quality it was considered that 10,000 cu.ft. of 16/17 candles were producible from one ton of coal, and there remained 10 cwt. of coke for sale with gas and tar. When more than, say, 60 gas therms are made the C.V. quality is less than 600. The gas therms over 60 are generally due to the addition of water gas, steaming of verticals, or pulling producer gas from the coke producers.

The straight gas produced from the carbonizing of coal in retorts is due to the volatiles (the cream of the coal). This part of the process depletes the weight of the ton of coal by but a few cwt. But unfortunately the whole ton of coal requires to be processed to provide these 60 gas therms.

Further we all realize that the three products, coke, gas, and tar, are produced in an unalterable proportion one to the other. No one product can be obtained without the other two. From each minute particle of coal, coke, gas, and tar are produced.

It is assumed that for the "Present Process" one ton of good coking gas coal contains 300 therms, and when 60 gas therms are produced $\frac{60}{300}$ of 20 cwt. of coal heat are present in the gas representing the heat contained in 4 cwt. of the original coal, or 20% of the coal processed. Likewise where hard non-coking coal is used in producers 300 gas therms are considered as contained per ton.

I submit that primarily the most important factor in the production of gas is the use of a plant in which the maximum heat energy of the coal processed in the form of gas is producible.

Assuming the gas-producing constituents amount to 300 therms per ton, how many of these therms are convertible into a serviceable gas for all purposes for domestic consumers? First consideration is due to the domestic user. The large industrial user can take care of himself. The small industrial user will have no cause to complain.

Coke is not a "by-product"; it is almost as good a raw material as coal where gas production is concerned. Indeed it is better than coal when considered in conjunction with the "Present Process," because from it 10 gas therms are producible per cwt., 200 gas therms per ton, compared with 3.375 gas therms per cwt. of coal, or 67½ gas therms per ton.

After 3 cwt. of coke have been used for heating retorts and the heat losses of the process are considered it is obvious that more than 10 cwt. of coal have been used for coke production. Therefore a round figure of 13½ cwt. of coal for coke and tar is not likely to be excessive, leaving 6½ cwt. of the coal ton as used for gas at the present day.

Why is the Gas Industry with £238,000,000 (reported as the capital held by stockholders) to-day in a dangerous commercial position? The broad answer is because it cannot compete with electricity generally for domestic heating purposes. What is the basic cause of this great disability? My answer is because one ton of coal is processed in a costly plant to produce 67½ gas therms at the rate of $\frac{67\frac{1}{2}}{20} = 3.375$ therms per cwt., when up to 10.125 therms could be produced. In other words, because, while the electric power station gasifies every ounce of one ton of coal to ash and clinker to produce current, the Gas Industry does not use more than one-third of a ton of coal, 6⅔ cwt., to produce gas, but 13⅓ cwt. to produce coke and tar.

Tar is a by-product; its production cannot (so far) be avoided, but coke is not necessarily a by-product, although it is sold as such. If the production of coke and tar for sale really allow gas to be sold more cheaply, can any man imagine that the electricity power stations would not avail themselves of this opportunity to produce current more cheaply? The cost of electricity would according to the present mentality of the Gas Industry (on this subject) reduce electricity costs to the vanishing point.

Coke and tar produced by the Gas Industry are sold very often for less than the coal costs to produce them, and in no case to my knowledge does a gas undertaking make a profit out of their production. If they do make a profit let them show the figures they use to arrive at such a conclusion.

Here follows the method of costing the gas therm for coal only adopted by the Gas Industry as I understand their figures.

	d.
One ton of coal costing 35s. or 420d. per ton	420
Less received for 9½ cwt. of coke and 2 cwt. of tar, say	280
Net cost of coal used to produce 67½ gas therms	140

Cost per gas therm $\frac{140}{67\frac{1}{2}} = 2.074$d.

Comment:

(1) The total cost of coal processed to produce 67½ therms is 420d.

(2) The cost allocated of 140d. represents but the cost of 6⅔ cwt. of coal.

(3) The actual cost is 140 × 3 = 420d., and the cost per gas therm 2.074 @ 3 = 6.222d.

(4) The balance of the cost of coal chargeable to coke and tar is 280d. This cost is not included in the calculation of 2.074d. per gas therm. Why?

A. 67.5 therms @ 2.074d. = 140d. for gas, the cost of 6⅔ cwt. of coal.
B. 67.5 „ 4.148d. = 280d. „ coke and tar, the cost of 13⅓ cwt. of coal.

6.222 = 420d. „ gas, coke and tar.

On this costing question I met a friend the other day who was good enough to indicate to me the reasons in his mind for the present method. He said:

"Our job is gas production. We obtain, say, 67½ therms of gas from a ton of coal. Whatever else we get is a by-product, therefore it is only fair to charge the main product, gas, with the cost of the whole ton of coal.

"One ton of coal costs 35s. or 420d.; all we want out of the ton is the 67½ therms.

"We sell the coke and the tar to help pay for the cost of producing this 67½ therms.

"Then to carry out this idea we reduce the cost of the coal by whatever we can get for the coke and tar.

"The remainder is chargeable to gas production, which in this case is 420d. less 280d., or 140d. as the *net cost of coal*."

My comment was: "This is tantamount (on the figures I am dealing with) to charging one-third of a ton of coal as if it were the full cost of one ton." "That is so," he agreed. In other words this shows that there is some life in the Gas Industry yet.

I submit there is no doubt about the present method of costing being entirely wrong.

The Proposed Process

I have the authoritative statement from one of the largest coal producer gas plant makers in the country that 190 therms are producible from one ton of coal in a quality of 170/180 C.V. gas. I accept this as a preliminary basis of fact. And I imagine that from a suitable hard and clean coal free from coal dust and smalls this result could be improved upon. From one ton of good coke 200 gas therms of 130 C.V. are assumed to be producible.

To facilitate calculations it is assumed that 202½ gas therms are producible from a good coal, or three times 67½ therms. The difference between 190 and 202½ is 12½ therms, or 6.75%, which is negligible so far as the comparison of gas for sale is concerned in each case.

The next question becomes what is the difference made in the revenue account between the production of 67½ gas therms, 9½ cwt. of coke, and 2 cwt. of tar for sale compared with 202½ gas therms, no coke, and ignoring the value of the tar produced. (See revenue account which follows.)

The answer is the value in the revenue account of 9½ cwt. of coke and 2 cwt. of tar sold less the cost for coal used in their production, compared with the difference between the production of 202½ gas therms and 67½ therms, or 135 extra gas therms, for sale, at 8d. per therm, 1080d., or 90s., gross revenue. (See revenue account.)

The cost for coal to produce 9½ cwt. of coke and 2 cwt. of tar is 35s. or 420d. (the cost of the ton of coal processed) less the cost for coal of the 67½ therms, which is taken as being 6⅔ cwt. at 21d. or 140d., or 23s. 4d. or 280d., the cost of 13⅓ cwt. of coal.

The extra 135 gas therms for sale at 8d. add 1,080d. gross to the revenue account or 1,080 less 240 = 840d. or 70s. per ton of coal increase in excess revenue. This is the advantage of producing 202½ gas therms without coke for sale and ignoring tar, instead of 67½ therms with coke and tar for sale.

Thus two-thirds of every ton of coal as at present processed is used in the production of coke and tar on which no profit is made, and therefore one ton out of every three is uselessly processed so far as the production of gas is concerned. There is no doubt that up to three times 67½ gas therms are producible from a ton without coke for sale.

It will be agreed that there is no difficulty in producing 10,000 cu.ft. or 60 therms in a rich gas of, say, 600 C.V. in retorts together with 10 cwt. of coke for sale. Likewise there is no difficulty in producing from 10 cwt. of good coke 100 gas therms in, say, 130 C.V. gas, which would account for 160 therms per ton in a gas of 184 C.V. thus:

	Cu.ft.	Therms.	C.V.	B.Th.U.
Straight coal gas	10,000	60	600	6,000,000
Coke producer gas	77,000	100	130	10,000,000
	87,000	160	184	16,000,000

I submit that some such method of mixing coke producer gas with straight coal gas as above outlined is worth consideration.

In the *Gas Times* of March 20 a Paper was published on "The Place of Heating Value in Gas Utilization" by Mr. A. J. Leather of Blackburn,

* From a Paper to the Midland Junior Gas Association.

in which tables are given of the C.V. of the theoretical air gas mixtures which show very little variation between 530 gas and 340 with other interesting particulars.

Calculated C.V. gross of gas. B.Th.U.	Calculated air gas mixture gross. B.Th.U.	Calculated C.V. gross of gas. B.Th.U.	Calculated air gas mixture gross. B.Th.U.	Calculated C.V. gross of gas. B.Th.U.	Calculated air gas mixture gross. B.T.U.
531½	94	449½	93	418	93
502	96	429	94	410	93
503	94	431	93	404	94
475	93	425	93	341	92½
449½	93	428	93½	200	76½
452	93	421	93	...	...

At one time a ton of coke was sold for a few shillings. To-day it does not pay to sell it at 40s. a ton. Consider the labour of producing and transport concerned with the production and sale of coke. Gas costs with coal at 35s. over 6d. per therm for coal alone, so that when its cost is calculated at 2.074d. its actual cost is three times greater. There is a like proportion in the *actual cost* of the present process per gas therm for coal (at the old coal prices) compared with the miscalculated prices. The miscalculated prices were about one-third of the actual—as they are now.

The by-products are about 50% of the total costs into holder. If the costs into holder now with coal at 35s. are 8d. or 9d., the by-products will roughly amount to 4d. or 4½d.

CASE A.—Present Process.

Revenue Account of Processing 1 Ton of Coal to produce 67½ Gas Therms, together with 9½ cwt. of Coke and 2 cwt. of Tar for sale.

Dr.	Pence.	*Cr.*	Pence.
To cost of 1 ton of coal, 35s. or 420d.	420	By sale of 67½ gas therms @ 8d. per therm . . .	540
		„ sale of 9½ cwt. of coke and 2 cwt. of tar at cost for coal	280
„ cost of 6¾ cwt. of coal @ 21d. per cwt., from which it is claimed 67½ gas therms are produced at a cost for coal of	140		
„ cost of 13½ cwt. of coal @ 21d. per cwt. from which 9½ cwt. of coke and 2 cwt. of tar are produced at a cost for coal of	280		
Total cost of coal for 67½ therms with coke and tar is 6.222d. per gas therm	420		
Excess revenue after paying for coal 140d. on sale of 67½ gas therms	400		
Excess of revenue after paying for coal used to provide coke and tar	—		
	820		820
		Excess revenue brought down produced on sale of gas only	400

CASE B.—Proposed Process.

Revenue Account of Processing 1 Ton of Coal to Produce 202½ Gas Therms without any Coke for sale and ignoring Tar produced for sale.

Dr.	Pence.	*Cr.*	Pence.
To cost of 1 ton of coal from which 202½ therms are produced @ 2.074d. per therm	420	By sale of 202½ gas therms @ 8d. per therm . . .	1,620
Excess of revenue on sale of gas after paying for coal, 1 ton	1,200		
	1,620		1,620
		Excess revenue brought down produced on sale of gas .	1,200

There is a coal producer plant at work in the Nuneaton district producing, I understand, 180 gas therms of 170/180 C.V. quality, with which gas there should be no difficulty in arranging with the owners of the plant for a demonstration.

We are all aware that to-day 10,000 cu.ft. of straight rich gas of, say, 600 C.V. are producible from an average quality of coal per ton, or 60 gas therms.

If a gas undertaking buys a ton of coal and produces from it three products for sale—gas, coke, and tar—it would not be unreasonable to charge a calculated or actual proportion of the cost of that coal to each of the products.

The revenue account "A" is not reconcilable with the statement "A" because the cost for 67½ gas therms together with coke and tar is 67½ @ 6.222d. = 420d. The whole process shows an excess of revenue of 400d.; while revenue account "B" shows the excess of revenue to be 1,200d., or three times that of "A." This is definite proof that the cost of gas per therm in case "B" is one-third of the cost of "A."

Also 67½ therms at the cost of 4.148d. per gas therm for coke and tar gives the product 280d. the figure left out in the computation of the cost of gas when taken as 2.074d. for gas only.

Again it is seen from the revenue account that the deduction of 280d. assumed to be received for coke and tar cannot be deducted from the cost of coal of 420d. and the remainder of 140d. be considered as the cost of a ton; because it represents the cost for coal used in the production of coke and tar it is not profit.

In its early days the staple product of a gas-works was gas for lighting to take the place of candles, and coke and tar were rightly considered as by-products. When it comes to heating, seeing that 10 cwt. of coke is capable of producing 70 gas therms in blue water gas of 300 C.V., or 100 gas therms in producer gas of 130 C.V., it cannot be considered as a by-product.

	Therms per cwt.	C.V.	Therms per ton.
1. Present process make per cwt. ...	3.375	500/600	67½
2. Blue water gas	7.000	300	140
3. Proposed process, complete gasification of coal	10.125	180/200	202½
4. Proposed process, complete gasification of coke	10.125	130	202½
5. Mixing 600 C.V. gas with coke gas	8.000	184	160
6. Gasification of anthracite	10.125	140	202½

These different gases may be mixed in any proportions desired and a much cheaper mixed gas be produced.

The effects of miscalculating the cost are obvious. For example, the South Staffs Mond Gas Company, I believe, sell gas of about 160 C.V. for about 5½d. to 6d. per therm as industrial gas in the different areas of gas supply which their Act covers. No gas undertaking in these areas is able, so far as I can imagine, to compete with this figure unless it reckons about one-third of the actual cost for coal to produce gas. I understand where Mond gas is available town gas authorities offer their gas under Mond prices. Mond gas people have not yet purified their gas, I think. This Company was incorporated about 35 years ago. I believe I said at the time that eventually town gas would be married to Mond gas or consumers would make their own mixture.

How can gas costing 6d. per therm or thereabouts for coal compete with electricity costing $\frac{420}{70}$ = 6d. per heat therm for current? Electric power stations can use a much inferior coal to that costing 35s. or 420d. which I have taken. 76½ therms are contained in 2,240 units of electricity. The Gas Industry can produce 202½ gas therms from a ton of good clean coal in my opinion, or $\frac{202\frac{1}{2}}{76\frac{1}{2}}$ = over 2½ times what electricity can do and which would leave a good margin for efficiencies.

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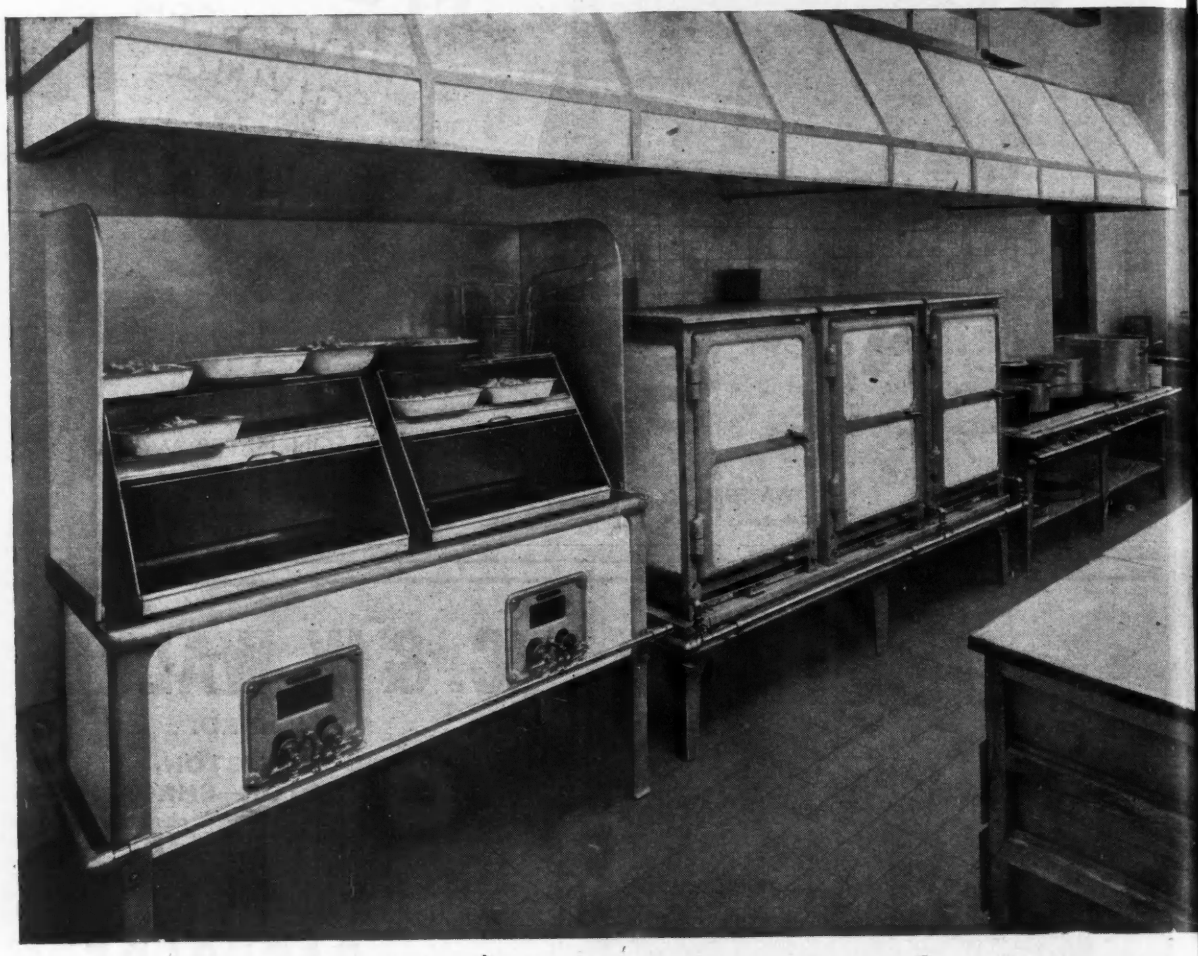
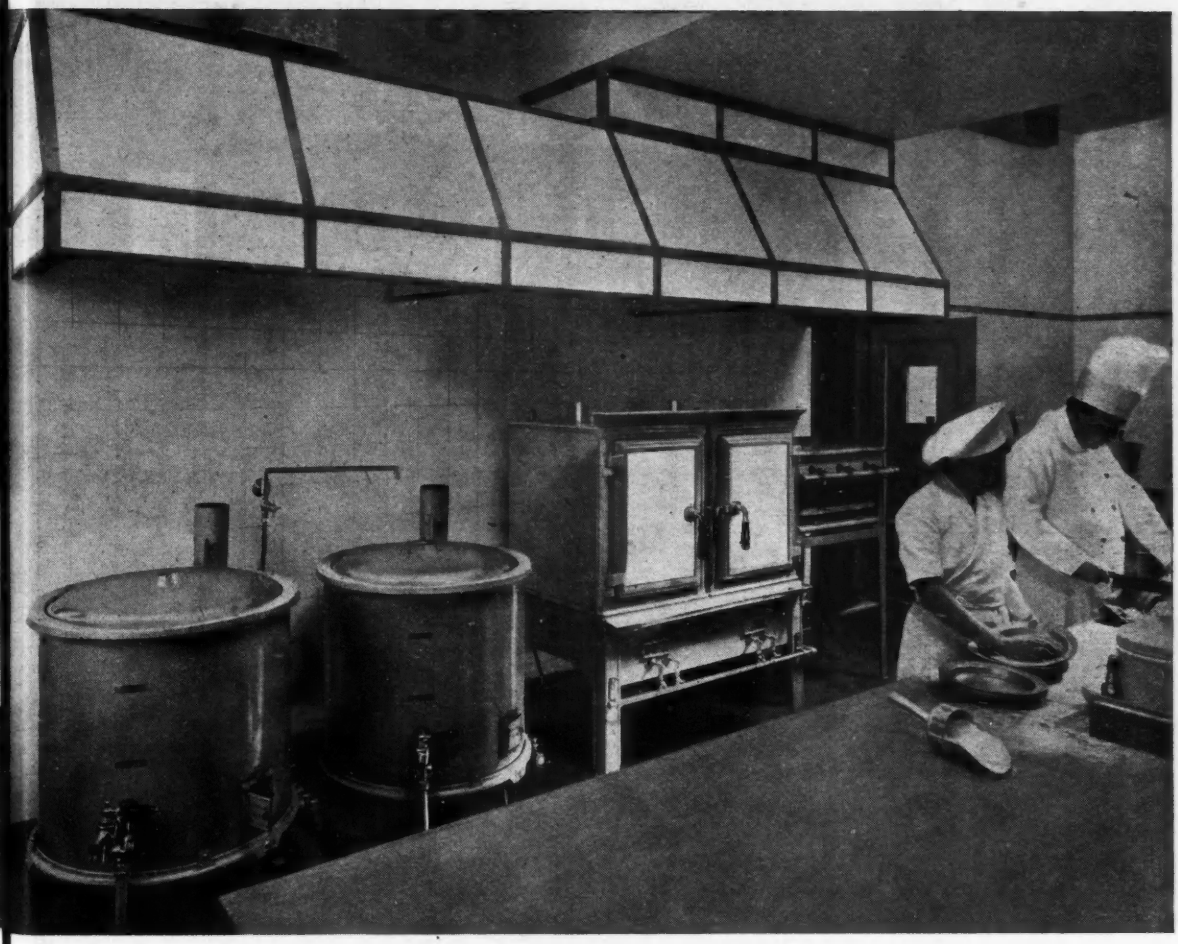


At the headquarters of the Milk Marketing Board the canteen kitchen and cafeteria were both designed and equipped by Radiation Ltd. A corner of the kitchen (above) shows a Wardour fish fryer, three roasting ovens mounted as a battery, and a Chester boiling table.

Radiation Ltd.

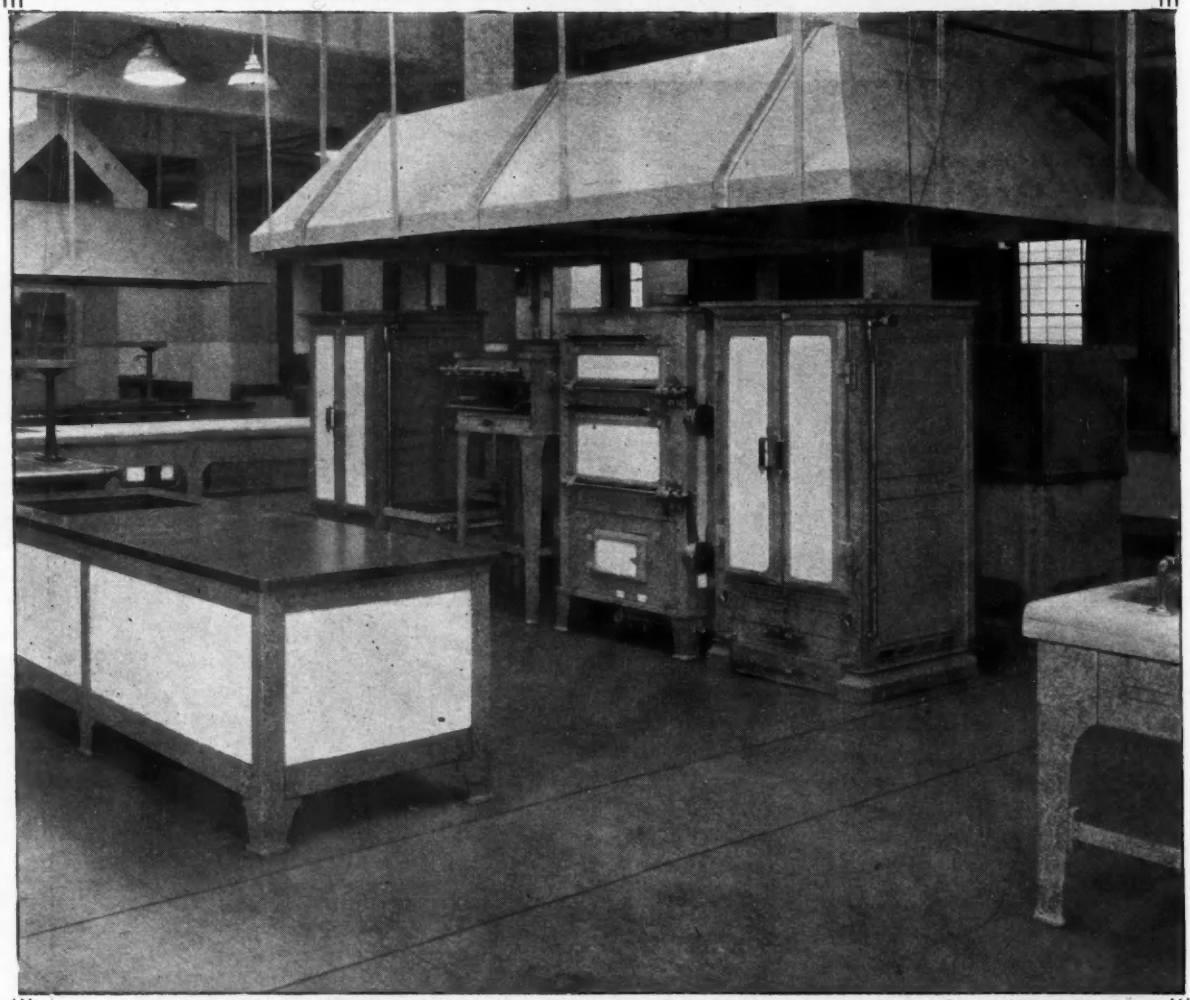
KETING BOARD



Another view of the same kitchen showing two 30-gall. Lune vegetable boilers, a double-compartment vegetable and pudding steamer and a Savoy griller. On the service side, Hotclosets are fitted beneath the cafeteria counter, which measures 25 ft. long with two 10 ft. 6 in. "return" ends.

LARGE COOKING EQUIPMENT SECTIONS
RADIATION HOUSE, ASTON, BIRMINGHAM, 6 | PALATINE WORKS WARRINGTON
SHOWROOMS AND LONDON OFFICE: 7, STRATFORD PLACE, W.1

LARGE-SCALE APPARATUS FOR THE COOKING AND SERVING OF FOOD



General view in the Principal Kitchen of a large Canteen Installation by

MAIN

R. & A. MAIN LIMITED, LONDON & FALKIRK

Present Process.

Using 3 Tons of Coal to produce 202½ Gas Therms, 28½ cwt. of Coke, 6 cwt. Tar. 67½ Gas Therms per ton.

Tons of coal processed.	Total gas therms for sale.	Heat units.	C.V. quality.	Total cu.ft. for 202½ therms.	Cu.ft. per ton for 67½ therms.	Coke produced for sale, cwt.	Tar produced for sale, cwt.	Cost per gas therm excluding coke and tar.	Cost of producing coke and tar per gas therm.	Total cost of gas therms including coke and tar.
3	202½	20,250,000	600	33,750	11,250	28½	6	2.074	4.148	6.222
3	202½	20,250,000	500	40,500	13,500	28½	6	2.074	4.148	6.222
3	202½	20,250,000	400	50,625	16,875	28½	6	2.074	4.148	6.222
3	202½	20,250,000	300	67,500	22,500	28½	6	2.074	4.148	6.222

Therms produced per cwt. of coal $\frac{202\frac{1}{2}}{60} = 3.375$.

Nine tons of coal are required to be processed to produce 607½ gas therms, 85½ cwt. of coke, and 18 cwt. of tar.

Proposed Process.

Using 3 tons of Coal to produce 607½ Gas Therms, no Coke and ignoring Tar. 202½ Gas Therms per ton.

Tons of coal processed.	Total gas therms produced for sale.	Heat units.	C.V. quality.	Total cu.ft. for 607½ therms.	Cu.ft. per ton for 202½ therms.	Cu.ft. for 67½ therms.	Coke for sale.	Tar for sale.	Cost per gas therm.
3	607½	60,750,000	200	303,750	101,250	33,750	None	...	2.074
3	607½	60,750,000	190	319,736	106,416	35,472	,,	—	2.074
3	607½	60,750,000	180	337,500	112,500	37,500	,,	—	2.074
3	607½	60,750,000	170	357,353	119,117	39,706	,,	—	2.074

Therms produced per cwt. of coal $\frac{607\frac{1}{2}}{60} = 10.125$, three times more than "present process."

The cost of 6 tons of coal saved out of 9 tons compared with present process when producing 607½ therms.

The cost of processing 6 tons of coal saved out of 9 tons compared with present process when producing 607½ therms.

The saving of the trouble and expense of handling and selling 85½ cwt. of coke, to say nothing of the tar.

Electricity.

The therms of heat produced in electricity per ton of coal are 3,415 B.Th.U. per unit × 2,240 = 75 therms per ton of coal.

Gas undertakings could produce $\frac{202\frac{1}{2}}{75} = 2.7$ times more heat than at present produced per ton of coal.

Present process 67½ gas therms per ton of coal to compete with 75 therms per ton in electricity. 7½ therms per ton.

Proposed process 202½ gas therms per ton of coal to compete with 75 therms less 2.7 times 75 therms, or 127½ more therms per ton than electricity.

In all the following revenue accounts the sales of coke and tar are shown as covering the entire cost of coal.

The approximate revenue account under the conditions given would be, assuming three times the gas therms (or 202½) to be produced by complete gasification compared with 67½ gas therms, as follows:

CASE 1.—Present Method. Cost of Coal only in which Sale of Coke and Tar cover Cost of Coal.

Dr.	Pence.	*Cr.*	Pence.
To produce 202½ gas therms 3 tons of coal require to be processed (3 tons at 35s.)	1,260	By sale of 202½ gas therms @ 8d. per therm	1,620
,, excess revenue after paying for coal	1,620	,, sale of coke and tar	1,260
	2,880		2,880

CASE 2.—Proposed Method. Complete Gasification.

Dr.	Pence.	*Cr.*	Pence
To processing of 3 tons of coal @ 35s.	1,260	By sale of 607½ gas therms @ 8d. per therm	4,860
,, excess revenue after paying for coal	3,600		
	4,860		4,860

CASE 3.—Proposed Method. Complete Gasification.

Revenue Account to produce 1,620d. after paying for coal to compare with present process.

Dr.	Pence.	*Cr.*	Pence
3 tons of coal to be processed to produce excess of revenue of 1,620d.	1,260	By sale of 360 gas therms @ 8d. (making 120 gas therms per ton)	2,880
Excess of revenue	1,620		
	2,880		2,880

CASE 4.—Alternative.

Dr.	Pence.	*Cr.*	Pence.
1.77 tons of coal to be processed to produce 202½ therms per ton	744	By sale of 360 gas therms @ 6.57d. per therm.	2,364
Excess revenue after paying for coal	1,620		
	2,364		2,364

Thus it will be seen that an excess of revenue after paying for coal of 1,620d. is produced when processing 3 tons of coal.

Alternatively the cost of coal by the proposed process at the rate of 202½ therms per ton would allow 360 therms to be sold at 6.57d. to produce a revenue of 1,260d. after paying for coal, and in addition a saving of 1½ tons of coal.

For every size of works and every class of coal...

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CARBONIZING PLANTS

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440 carbonizing plants have been built or are under construction by West's in 24 countries. Working results from a wide variety of gas coals have established the high efficiency and adaptability of the West systems.

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LONDON OFFICE: COLUMBIA HOUSE, ALDWYCH, W.C.2 TELEPHONE: HOLBORN 4108-9 TELEGRAMS: WESGASCO ESTRAND

PRESENT PROCESS—1 TON OF COAL.

Revenue Account.

Dr.	Pence.	*Cr.*	Pence.
To 1 ton of coal 35s.	420	By sale of 67½ gas therms at net cost of coal 2.074d.	140
Less 9½ cwt. of coke and 2 cwt. tar taken at cost	280	„ revenue @ 1d. per therm over cost of coal (67½ @ 3.074d. = 207.5d.)	67½
Net cost of coal	140		
„ excess revenue after paying for coal	67.5		
	207.5		207.5
		Brought down excess revenue over cost of coal	67.5

PROPOSED PROCESS—1 TON OF COAL.

Revenue Account.

Dr.	Pence.	*Cr.*	Pence.
To 1 ton of coal taken at the assumed figure of present process	140	By sale of 202½ gas therms @ $\frac{2.074}{3}$ = 0.691d.	140
„ excess revenue after paying for coal	202.5	„ revenue @ 1d. per therm over cost of coal (202½ @ 1.691d. = 342.5d.)	202.5
	342.5		342.5
		Brought down excess revenue over cost of coal	202.5

Note.—The figure left out in each of the above cases on the *Dr.* and *Cr.* side is 280d., the cost of producing coke and tar.

PRESENT PROCESS. 3 TONS OF COAL.

Revenue Account.

Dr.	Pence.	*Cr.*	Pence.
To cost of 3 tons of coal	1,260	By sale of 202½ gas therms at net cost of coal 2.074d.	420
Less 28½ cwt. coke and 6 cwt. tar taken at cost	840	„ revenue at 1d. per therm over cost of coal (202½ @ 3.074d. = 622.5d.)	202½
Net cost of coal	420		
„ excess revenue after paying for coal	202½		
	622½		622½
		Brought down excess revenue over cost of coal	202½

PROPOSED PROCESS. 3 TONS OF COAL.

Revenue Account.

Dr.	Pence.	*Cr.*	Pence.
To cost of 3 tons of coal taken at the assumed figure of present process	420	By sale of 607½ gas therms @ $\frac{2.074}{3}$ = 0.691d.	420
„ excess revenue after paying for coal	607½	„ revenue @ 1d. per gas therm over cost of coal (607½ @ 1.691d. = 1,027½)	607½
	1,027½		1,027½
		Brought down excess revenue after paying for coal	607½

Note.—The figure left out in each of the above cases on the *Dr.* and *Cr.* side is 840d., the cost of the coke and tar produced.

DISCUSSION

The **President** (Mr. F. J. Bengough) said he saw no sense in having to increase the size of gas-works, condensing, washing, and purifying plants, and mains to deal with inert gases. Distributing systems would also be severely taxed in dealing with these unnecessary inerts, although Mr. Helps claimed much lower pressures would suffice. He would prefer to use bituminous coals in producer gas units similar to the Tully system, which would give about 150 therms per ton of coal, gas with an inert content of about 12%, and be self supporting in steam. As an Industry they could not afford to scrap any plant that was still efficient, but as present plants became obsolete and capital had to be spent on new plants consideration might be given to some such type of plant so that any agreed change in gas quality would be gradual.

Alderman **Smith** (Nuneaton) said he had been interested in Mr. Helps' theories, and 200 C.V. gas had been distributed in Nuneaton for about 12 years. The business of a gas undertaking was to sell gas, and it was no part of its economy to produce coke which was sold for less than its cost of production.

Mr. **Brockbank** (Walsall) suggested they ought to have a few figures on the actual cost of production in Nuneaton at the present time. If he was not prepared to say what his cost of production was, could Mr. Helps say at what price he was selling gas in Nuneaton to-day?

Mr. **Smith** (Industrial Research Dept., Birmingham) said the basic figure they had to get down to was the figure of the cost of material, labour, depreciation, interest on capital, and supply of electricity and water, and balance that against the cost of pushing the gas through consumer burners.

It was the overall cost which was important, and on a low grade gas the depreciation cost would naturally go up.

Mr. **J. K. Mitchell** (Dudley) said instead of calling themselves the Gas Industry they should call themselves the carbonizing industry because the fact was they deliberately made two fuels—gas and coke. They did not regard coke as a by-product. He did not agree with Mr. Helps' method of accounting.

Mr. **F. N. Tidball** (Cannock) urged that the figures were a pet theory of Mr. Helps' and it was complete gasification which should be discussed. He agreed that coke was not regarded as a by-product, but had been pushed as a smokeless fuel and would be pushed still further after the war.

Mr. **W. N. Smirles** said it seemed to him the greatest disadvantages were in regard to distribution when they had gas of 200 C.V., of which 50% was nitrogen.